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Book 167

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PATENTS FOR INVENTIONS.

ARRANGEMENTS

OF

Specifications

OF

AERONAUTICS.

BY

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BY

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1890

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DE LA BANCQUE, 22
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Anglais, Allemands,
Espagnols, Portugais,
rues du Nord.

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PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

AERONAUTICS.

A.D. 1815-1866.

PRINTED BY ORDER OF THE COMMISSIONERS OF PATENTS.



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P R E F A C E.

THE Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of Invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 59,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct Inventions, and many of those filed under the new law of 1852 indicate various applications of the single Invention to which the Patent is limited. Considering, therefore, the large number of Inventions and applications of Inventions to be separately dealt with, it is possible that a few properly belonging to the group which forms the subject of this volume may have been overlooked. In the progress of the whole work such omissions will, from time to time, become apparent, and be supplied in second or supplemental editions.

The present series comprises Abridgments of Specifications that treat of balloons or other means of ascending in the air or of navigating the air ; and it includes the application of balloons or kites for suspending, partially suspending, drawing, or other purposes.

The term "balloon" is applied in several Specifications to vessels inflated with air or gas and immersed in water, but which only have an ascensional force whilst so immersed. Abridgments of such inventions are not included in the present series, unless the Specifications also describe appliances equally applicable to aerial balloons or other subjects treated of in this book.

The Abridgments marked thus (**) in the following pages were prepared for another series or class, and have been transferred therefrom to this volume.

B. WOODCROFT.

November, 1869.

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INTRODUCTION.

THE history of aeronautics is so discontinuous, and it is so much removed from the practical spirit of the Specifications of Patents, that it is necessary to set forth, in this place, the connecting links that bind that history together.

Many ideas expressed by the ancients, in fables and otherwise, especially the accounts of ICARUS and DAEDALUS, show that mankind always had in view the possibility of elevating themselves in the air.

The term aeronautics is rather in advance of the condition of the subject at the present day, since no means is known by which a heavy body may be elevated into the air and navigated therein as a ship is navigated on the sea. The utmost that has been done is to take advantage of the different aerial currents that exist at a given time at various elevations, and, by raising and lowering a gas balloon accordingly, to approximate to the desired direction. The various methods (many proposed, and a few realized) that have the accomplishment of aerial navigation for their object, may be classified thus :—1. Kites. 2. Fire balloons. 3. Hydrogen balloons. 4. Coal gas balloons. 5. Mechanical apparatus.

Kites have been in use for the purposes of amusement from time immemorial amongst the Chinese and Japanese. More recently they have been used occasionally to convey a line to a ship in distress in cases of shipwreck, to investigate the electrical condition of the upper regions of the atmosphere, and even to propel carriages along a road. Fire balloons are so called from the fire which must be constantly kept burning beneath them; the proximate cause of their ascent into the ordinary air is the rarefied air which they contain; these are sometimes called "Montgolfieres." Hydrogen balloons ascend in consequence of the superior lightness of the hydrogen gas with which they are filled, hydrogen being about fourteen times lighter than air. The "inflammable air" of the earlier authors on aeronautics generally

means hydrogen gas; this was generated by the action of weak sulphuric acid upon zinc or iron filings. Coal gas, although heavier than hydrogen, is much used to inflate balloons. The mechanical means of flight is at present only represented by a toy called the "aerial top," which has light, but strong blades attached to its axis, at a certain acute angle thereto.

In this place it is proper to draw the attention of investigators in this department of science to the very complete series of works on aeronautics accessible to the public at the Patent Office Library. One manuscript work is especially noticeable, entitled *Aeronautica Illustrata*. This is an extensive and valuable collection of writings, illustrations, and original documents that have been collected and arranged in the course of years.

The summary that follows does not pretend to be a complete history, but it puts forward in chronological order many of the most important matters connected with the subject. It is not the province of this work to decide priority of invention, or to set forth authoritatively the date of the commencement of any specific improvement in the subject of which it treats; therefore, in this introduction, as elsewhere, the utmost pains are taken to ascertain the earliest attempts, but the dates are left to speak for themselves. The registration of scientific data is aimed at, not a collection of ascents; however remarkable they may be from other points of view, ascents as such, are not taken account of here.

B.C.

400. ARCHYTAS (400 B.C.) "constructed a wooden pigeon, which " could fly by mechanical means. To wit, it was thus " suspended by balancing, and was animated by an " occult and enclosed aura of spirit." If the pigeon fell, " it could not lift itself up any more." (See Aulus Gellius, *Noctes Atticæ*, lib. x., cap. xii.; also *The History and Practice of Aerostation*, by Cavallo, London, 1785, p. 6.)

A.D.

1650. JOHN BAPTIST DANTE, about 1650, "is said to have " framed certain wings, by means of which he flew " several times, but at last had the misfortune of break- " ing one of his thighs in an attempt of that sort." (See Bourgeois' *Recherches sur l'art de Voler*; also Cavallo's *History and Practice of Aerostation*, London, 1785, p. 19.)

A.D.

1736. DR GUSMAN, in 1736, "made a wicker basket, of about seven or eight feet in diameter, and covered with paper, which basket elevated itself as high as the tower of Lisbon, which is about 200 feet high." (See Bourgeois' *Recherches sur l'art de Voler*; also Cavallo's *History and Practice of Aerostation*, London, 1785, p. 26.)
1767. DR. JOSEPH BLACK, of Edinburgh, in 1767, stated in his lectures that it was an obvious consequence of Cavendish's discovery of the lightness of "inflammable air" (or hydrogen gas), that "if a sufficiently thin and light bladder were filled with inflammable air, the bladder and air in it would necessarily form a mass lighter than the same bulk of atmospheric air, and which would rise in it." (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 32.)
1782. TIBERIUS CAVALLO, in the early part of 1782, after trying many experiments, with paper envelopes, &c., caused "soap balls," or bubbles filled with "inflammable air," to ascend to the ceiling of a room. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 34.)
1782. STEPHEN MONTGOLFIER, in November 1782, at Avignon, made a fine silk bag "in the shape of a parallelopipedon, the capacity of which was equal to about 40 cubic feet. Burning paper applied to its aperture served to rarefy the air." (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 43.)
1783. STEPHEN and JOHN MONTGOLFIER, on June 5, 1783, at Annonay, before the States of Vivarais, caused a fire balloon, or a balloon of rarefied air, to ascend to the height of about 6000 feet. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 45.)
1783. MM. CHARLES and ROBERT, on August 27, 1783, caused a balloon filled with "inflammable air" to ascend from the Champ de Mars, Paris, to a height of 3123 feet, in the presence of many hundred thousand spectators. This balloon fell fifteen miles from Paris. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 60.)

A.D.

1783. M. DESCHAMPS, a painter, at Paris, in 1783, proposed to the BARON de BEAUMANOIR to try gold-beaters' skin for an air balloon. The Baron, on September 11, 1783, successfully launched a balloon 19 inches diameter, made according to this plan; it went out of sight. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 63.)
1783. J. MONTGOLFIER, on September 19, 1783, launched a fire balloon, from Versailles, in the presence of Louis XVI. and the royal family. This machine carried a sheep, a cock, and a duck; they alighted in safety in the wood of Vaucresson. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 69.)
1783. M. PILATRE DE ROZIER, on October 15, 1783, ascended to about 84 feet from the ground in the gallery of a fire balloon. This ascent was limited by ropes that detained the balloon. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 75.)
- M. PILATRE DE ROZIER and MARQUIS D'ARLANDES,
1783. on November 21, 1783, performed an aerial voyage in a free fire balloon from the garden of the Château de la Muette, near Paris. The aeronauts descended about 9000 yards from the place of ascension. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 83.)
1783. MM. ROBERT and CHARLES, on December 1, 1783, ascended in an air balloon from the Tuileries. This balloon descended in safety at Nesle, again rose with M. Charles alone in it, and descended three miles from the place of its second ascent. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 98.)
1783. M. LE NORMAND, in 1783, employed a parachute to let himself down from the windows of a high house at Lyons. The practical application contemplated was escape from fire. (See Monk Mason's *Aeronautica*, London, 1838, p. 231.)
1784. M. JEAN PIERRE BLANCHARD, on March 2, 1784, ascended in an air balloon from Paris and descended near Sevres. "He carried up with him wings, a gouvernail, " and a sort of umbrella to break his fall in case of an

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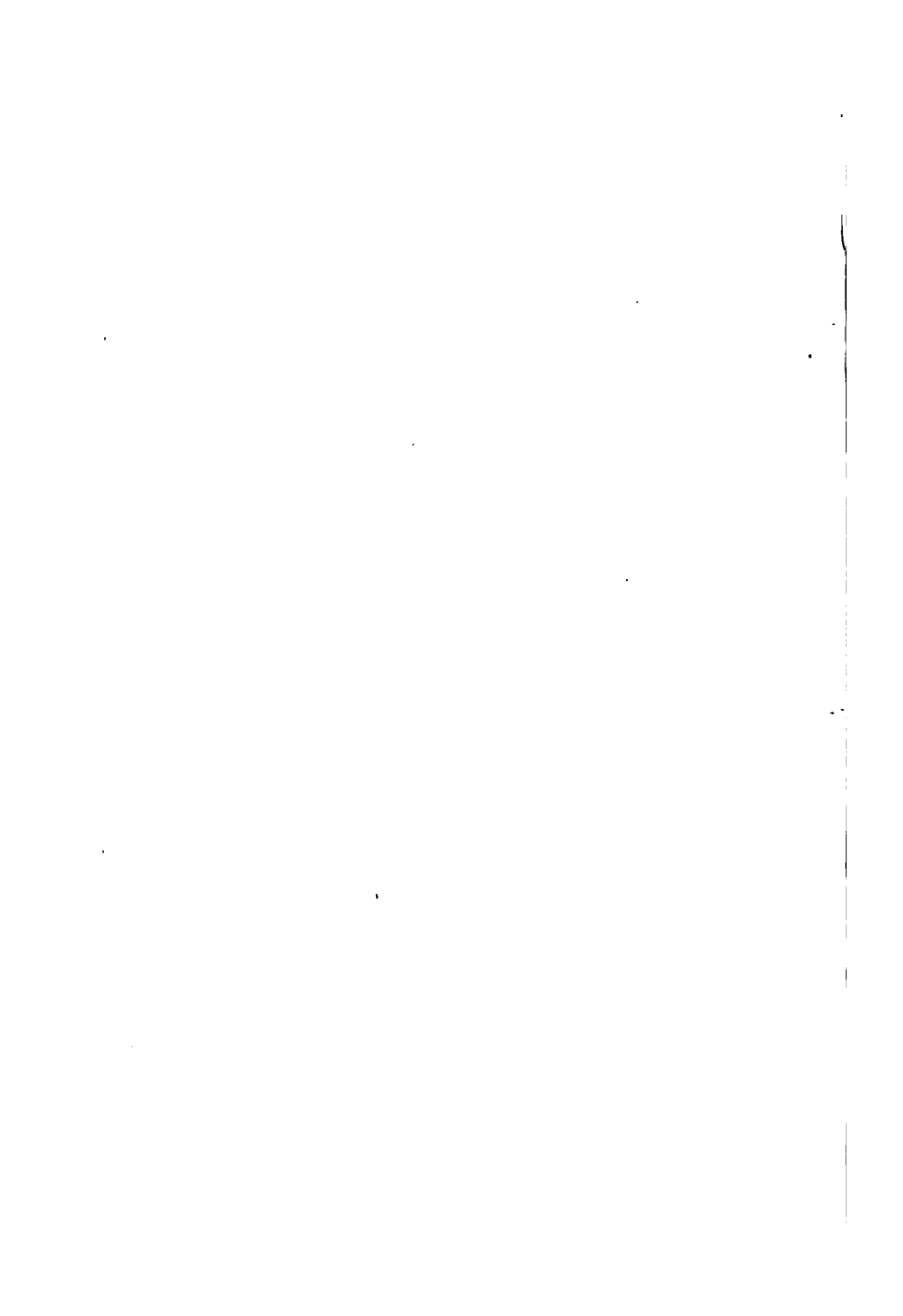
- "accident." (See *Annals of some Remarkable Aerial and Alpine Voyages*, by T. Foster, London, 1832, p. 11.)
1784. M. DE SAUSSURE, in a letter dated March 26, 1784, "mentions his having made some experiments on the "atmospherical electricity, with an aerostatic machine, "which was raised by means of the combustion of spirits "of wine, and was fastened to a long string. In a cloudy "day he obtained a positive electricity strong enough to "afford sparks." (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 135.)
- MONS. FLEURANT, and MAD. THIBLE, on June 4, 1784, ascended from Lyons, in a fire balloon called "Le Gustave." The first observations of a scientific character were said to be made on this voyage. (See art. *Aeronautics* in 8th ed. of *Encyclopædia Britannica*; also Cavallo's *History and Practice of Aerostation*, p. 142.)
1784. DR. JOSEPH BLACK, in 1784, wrote to Dr. James Lind, stating that, in that year, his experiment of raising a bladder by means of "inflammable" air had been tried with success. (See Cavallo's *History and Practice of Aerostation*, London, 1785, p. 33.)
1785. TIBERIUS CAVALLLO, in 1785, notices that "pit coal, exposed to a red heat, gives abundance of inflammable "air." He remarks further—"It appears, therefore, "that pit-coal is the substance which may be most advantageously used for the production of inflammable "air in aerostation." In a foot note, he states that, "On the continent, various small balloons have been "filled with the inflammable air of pit-coal, and have "floated exceedingly well." (See Cavallo's *History and Practice of Aerostation*, London, 1785, pp. 233, 235; also *Memoire sur l'air inflammable, tiré de différentes substances*, rédigé par M. Minkelers, Louvain, 1784.)
1793. M. BLANCHARD, in 1793, endeavoured to demonstrate the efficiency of a parachute. He came to the ground quickly and broke his leg. (See Monk Mason's *Aeronautics*, London, 1838, p. 231.)
1794. GUYTON DE MORVEAU, on June 26, 1794, at the battle of Fleurus, had the charge of a balloon for reconnoitring

A.D.

- the Austrian position. This balloon is said to have done good service to the French cause. (See *Aeronautica Illustrata*, a voluminous collection of valuable papers in the Patent Office library; also art. *Aeronautics* in *Encyclopædia Britannica*.)
1797. ANDRÉ JACQUES GARNERIN, on October 21, 1797, descended from a balloon by the aid of a parachute. The parachute was separated at a height of about 2000 feet. (See Monk Mason's *Aeronautica*, London, 1838, p. 231.)
- MM. GAY LUSSAC and BIOT ascended from Paris on Aug. 23, 1804, to make scientific experiments. They reached a height of 13,000 feet, and did not find any difference between their results and those obtained on the earth. (See Glaisher's *Scientific Experiments in Balloons*, p. 9.)
1804. M. GAY LUSSAC, on September 15, 1804, ascended to the height of 22,977 feet. "He found the time of the vibration of a magnet to be less than on the earth." His respiration was affected. The temperature and humidity of the air decreased. "He filled some glass bottles with air from the higher regions; was five hours and three-quarters in the air, and noticed that the sky was of a deep blue." (See *Scientific Experiments in Balloons*, by James Glaisher, 1862, p. 9; also Foster's *Aerial and Alpine Voyages*, 1832, p. 52.)
- MR. CHARLES GREEN made his first ascent on July 19, 1821, the coronation day of his Majesty George IV. He is said to be the first that employed coal gas. (See *Aeronautica Illustrata* and Monk Mason's *Aeronautica*, p. 5.)
- MESSRS. CHARLES GREEN, HOLLAND, and MONCK MASON, on Nov. 7, 1836, started in the "Nassau Balloon" from Vauxhall Gardens, and accomplished a journey to Weilburg, in the Duchy of Nassau, in eighteen hours. (See Monk Mason's *Aeronautica*, also *Aeronautica Illustrata*.)
1837. MR. COCKING, on July 24, 1837, descended in a parachute, from a balloon, and was killed. The parachute was according to his own design, and was shaped like an inverted cone. (See Monk Mason's *Aeronautica*, London, 1838; also *Aeronautica Illustrata*.)

A.D.

1852. MR. WELSH, of the Kew Observatory, in the year 1852, made four ascents in the great Nassau balloon with Mr. Green. The greatest altitude that he reached was 22,930 feet. He observed that "the temperature of the air decreases uniformly with the height above the earth's surface, until at a certain elevation, varying on different days, the decrease is arrested, and for a space of 2000 or 3000 feet the temperature remains nearly constant, or even increases by a small amount; the regular diminution being afterwards resumed, and generally maintained at a rate slightly less rapid than in the lower part of the atmosphere, and commencing from a higher temperature than would have existed but for the interruption noticed." (See Glaisher's *Scientific Experiments in Balloons*, p. 10.)
1862. MR. JAMES GLAISHER, on July 17, 1862, ascended with MR. COXWELL, from Wolverhampton, to a height of nearly five miles. The temperature of the air and the dew point were determined at various altitudes; electrometer readings, times of magnetic vibrations, ozone observations, and other data were obtained. This was the first of a series of eight balloon ascents undertaken at the request of a committee appointed by the British Association for the Advancement of Science to make meteorological and physical observations at different elevations above the earth's surface. (See *Report of the British Association for the Advancement of Science* for 1862; also *Scientific Experiments in Balloons*, by James Glaisher, p. 29.)
1865. MR. JAMES GLAISHER, on Oct. 2, 1865, in pursuance of his researches for the balloon committee of the British Association for the Advancement of Science, made his first night ascent. This night was remarkably clear, and the temperature, up to a certain elevation, increased with the increase of elevation. (See *Report of British Association Meeting*, at Nottingham, in 1866.)
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AERONAUTICS.



AERONAUTICS.

A.D. 1815, April 25.—N° 3909.

PAULY, SAMUEL JOHN, and EGG, DURS.—“Certain aerial conveyances, and vessels to be steered by philosophical or chemical and mechanical means, and which means are also applicable to the propelling of vessels through the water and carriages or other conveyances by land.”

The aerostat or balloon has a “form whose farthest extremities may be in an horizontal and longitudinal direction, or nearly so, such as the shape of a fish or bird.” A frame round the lower part of the aerostat, called “the head frame,” holds the net, as well as an appendage capable of acting as a parachute, and the requisite suspensory fastenings of the car. To drive and direct the balloon, “fins, feathers, fans, or wings” are employed; they are made of silk fixed to a staff by whalebone ribs. Five feathers may form a wing, and for that purpose are fixed alongside into a “head piece,” which is applied to a steel spring “fastened to the head frame, playing backwards and forwards horizontally.” Each separate fin, feather, fan, or wing has a threefold power, “which we call *attractive*, aspiring or sucking, *repulsive*, driving or blowing, and *collective* or uniting.”

The tail or rudder is formed of the same materials as the said fins. A moveable weight, consisting of a barrel containing water, is used as ballast for guiding and directing the balloon. The said fins may also be applied to a machine that is capable of raising and supporting itself in the air without the assistance of gas.

[Printed, 4d. No Drawings. See Repertory of Arts vol. 31 (*second series*), p. 17; also Rolls Chapel Reports, 7th Report, p. 118.]

A.D. 1826, October 18.—N° 5420. (* *)

VINEY, JAMES, and POCOCK, GEORGE.—“An invention by which kites are made to act as endyant sails for the purpose of

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“ navigating or drawing vessels or drawing carriages, for the purpose of raising weights or persons in the air, and for other useful purposes.”

“ The peculiarities of these kites are :—First, they are rendered portable by folding up.” “ Second, there is a moveable distender.” “ Third, they have four lines by which their power is controlled or their course directed.” Fourth, the kites may be attached “ at a convenient distance one behind the other, by which plan an indefinite power may be obtained.”

[Printed, *Ed. Drawing.* See Repertory of Arts, vol. 4 (*third series*), p. 389; London Journal (*Newton's*), vol. 1 (*second series*), p. 29; Register of Arts and Sciences, vol. 1 (*second series*), p. 1; Engineers' and Mechanics' Encyclopedia, vol. 1, p. 323, also vol. 2, p. 478.]

A.D. 1840, January 7.—No 8337.

POOLE, MOSES (*a communication*). — “ The invention consists in obtaining power by means of an apparatus, the arrangement of which consists of a series of blades or surfaces fixed in an oblique direction to an axis, which axis is made to revolve, and consequently to carry them round at any velocity required, the atmosphere acting as the point of resistance, whereby I am enabled to obtain a great power, which may be employed for propelling boats, carriages, &c.”

“ To act successfully the machine or apparatus should be completely surrounded with the atmosphere in which it is working.” The said blades turn “ round an axis parallel to the line of draft.” “ The essential character of this invention is the arrangement of a series of flat blades placed in oblique positions to the surfaces which pass through the axis of the apparatus. These blades or surfaces may be made of metal, wood or any suitable material; the obliquity of the position may be varied from one to eighty-nine degrees, according to the power of the wind you have to act against, whether it is fair or foul, or whether this apparatus is to be used in water. The number of these blades may be varied from two to twelve, according to the size of the machine; they may be placed two or three together if required. The size of these blades must depend upon the power required.”

“ This apparatus may be applied to move any description of vessel, either floating in the air or in the water.”

[Printed, *Ed. Drawings.*]

A.D. 1842, September 29.—N° 9478. (* *)

HENSON, WILLIAM SAMUEL. — “Machine for conveying letters, goods, and passengers from place to place through the air.”

“If any light and flat, or nearly flat, article be projected or thrown edgewise in a slightly inclined position, the same will rise on the air till the force exerted is expended, when the article so thrown or projected will descend, and it will readily be conceived, that if the article so projected possessed in itself a continuous power or force equal to that used in projecting it the article would continue to ascend, so long as the forward part of the surface was upwards in respect to the hinder part and that such article when the power was stopped, or when the inclination was reversed would descend by gravity only if the power was stopped, or by gravity aided by the force of the power contained in the article if the power be continued, thus imitating the flight of a bird.”

The apparatus is constructed to offer a very light extended surface or plane, which has the same relation to the general machine that the extended wings of a bird have to the body, when the bird is skimming in the air; but, in place of the movement or power for onward progress being obtained by movement of the extended surface, as is the case with the wings of birds, suitable paddle wheels, or other propeller, worked by a light steam engine, are employed to obtain the requisite power for onward movement to the extended surface or plane; and to give control as to the upward and downward direction of the machine, a tail is applied to the extended surface which may be inclined or raised, so that when the power is acting to propel the machine by inclining the tail upwards, the resistance offered by the air will cause the machine to rise on the air; and, when the tail is reversed, the machine is propelled downwards, and passes through a plane more or less inclined to the horizon as the inclination of the tail is greater or less. To guide the machine as to the lateral direction which it takes, a vertical rudder, or second tail is introduced, and as this is inclined in one direction or the other, so will be the direction of the machine.

The extended surface is disposed on each side of a car or vessel in which engine, fuel, passengers, goods, and letters are carried; the boiler is fixed rather forward in the car, as the weight

should be forward. The car has three wheels that, when it comes to the earth, it may run freely without injury, and owing to the great control the tail has in governing the descending machine, the car comes to the earth in so flat an incline that little if any shock is felt by the passengers. The machine is started from an inclined plane or side of a hill. The propellers being set in motion, and the machine allowed to run forward on the decline, in a short time they act sufficiently on the air to cause the machine to leave the incline and proceed in any direction.

The whole machine has been combined to form one trussed beam of very light construction in which wire is mostly used, and in a few places hollow bars of wood. All the upper and under surfaces of the projecting planes are covered with a strong close fabric such as oiled silk. There should be about one square foot of extended surface for each half pound weight of the machine, including machinery, fuel, and load; the entire experimental machine might weigh about 3,000 pounds. The surface of the planes on both sides of the car measures about 4,500 square feet, the tail 1,500 square feet additional. The high-pressure steam engine with which the machine was moved had the power of from 25 to 30 horses.

2. Describes a steam engine for giving motion to the propellers of the machine. The copper boiler has great strength with lightness, and its extensive heating surfaces are arranged to produce great power in small space.

The construction of this elaborate machine is illustrated by a profusion of drawings on a large scale.

[Printed, 3s. 10d. Drawings. Repertory of Arts (*enlarged series*), vol. 1, p. 237; Mechanics' Magazine, vol. 38, pp. 257 and 305; Engineers' and Architects' Journal, vol. 6, pp. 150, 187, and 219.]

A.D. 1843, January 19.—N° 9598. (* *)

SUNDERLAND, THOMAS.—Improvements in "moving floating bodies through water and air, such as ships and balloons."

1. Screw propeller. Each blade is on a short arm, and is of a form bounded by two arcs of circles, the outer circle being concentric with the shaft, and the other having its convexity turned to the shaft. 2. Steam issues from a pipe against the air and propels a vessel. 3. The draught in a furnace is increased by a blower in the flue, and a damper regulates the supply of air,

[Printed, 6d. Drawing.]

A.D. 1843, February 21.—N° 9642.

POTTS, LAWRENCE HOLKER.—“A new or improved method or “ methods of conveying goods, passengers, or intelligence.”

A “tension” line of rails, composed of metallic rods or wires stretched from one fixed point to another, is employed for the said purposes. Air tubes, through which the articles are made to travel, may assist the said tension rails, especially on lines of great traffic.

Various modes of propulsion of the cars or carriages that contain the goods, may be used. “By connecting balloons to the “ railway cars,” “on their receiving impulse from superior strata “ of the atmosphere, they will, by means of the pied-a-terre “ afforded by the railway, become of greater utility than they “ have hitherto been. The line or rope of traction should be connected by a safety line to a valve, so that the hydrogen might “ be allowed to escape when necessary.”

A “chiro pedal machine” is described in the Specification, and shown in the Drawings, that may be used to impel aerial machines. The machine consists of an arrangement of treadles, handles, and cranks, by means of which the whole weight and muscular action are utilized to produce motion. This power is applicable to actuate wings or cars; the power may be applied by a lever, “or directly to the wing or car, a cord passing over the pulley “ being used for the purpose.” A sail may be employed to propel the machine; its body may “consist of sheet iron tubing, “ into which air might be pumped at leisure.”

[Printed, 1s. 4d. Drawings.]

A.D. 1843, July 26.—N° 9856.

MOAT, WILLIAM CROFTON.—“A method of obtaining aerial “ locomotion.”

The machine which forms the subject of this invention consists of “an oblong framework of wood, which rests when on the “ ground on legs,” and the longitudinal bars of which carry two wooden platforms for the support of persons by whom the machine is to be worked. A transverse cranked axle has a vertical grooved wheel mounted on its centre, which communicates rotary motion to two transverse shafts pivoted at the ends of the framework, one at each end, by means of endless bands. Four wheels work eccentrically with regard to certain cross arms on the said trans-

verse shafts, and by means of friction wheels, impart motion to four square frames of wood. Sixteen "wooden frames" are attached to the four cross arms, and also to the square frames ("four to each arm and frame"), and carry sixteen propelling flappers, each of which consists of a rectangular frame covered over with parchment, and attached by pins to the extremities of its particular wooden frame, so as to swing freely thereon. A rudder guides the apparatus, and a platform for the steersman projects in front.

When manual power is imparted to the cranked axle, and thence to the frames and propelling flappers, the flapper frames "move always in the same parallel," and cause the flappers "to strike successively upon the air in a direction opposite to that of the lines of gravity and traction, or their conjugate, and thereby to raise the machine and propel it through the air." Certain modifications are pointed out.

[Printed, 1s. 4d. Drawings. See *Engineers' and Architects' Journal*, vol. 7, p. 61.]

A.D. 1847, February 15.—N° 11,578.

NEWTON, WILLIAM EDWARD (*a communication from Dr. Van Hecke*).—"Improvements in aerial locomotion."

The said improvements are called by the inventor "a new system of aerial locomotion or aeronautic carriage, containing a motive power, and a point of resistance or fulcrum, by means of which passengers may be conducted through the air in any required direction," and, in carrying out this invention, advantage is taken of the "strata of currents of air" that blow in various directions at different altitudes, so that, by the ascent or descent of the aeronaut into the current that blows in the direction required, the aerostatic machine may progress to its destination.

The propelling apparatus consists of two steel rods, which are mounted horizontally and at right angles to each other upon a vertical shaft; the said vertical shaft is rotated by means of ropes and pulleys that connect the said shaft with the driving power. Wings are attached to the steel rods, the former being oblique to the axis. The Drawings show four propelling apparatus to one machine, suspended from a balloon; or from a number of cylindrical gas vessels, one above another, that act collectively as a

balloon. The fore propellers are worked in an opposite direction to those that are in the stern of the "aeronautic carriage," and thus "a point of resistance" is obtained, by means of which the balloon is propelled in the required direction.

By means of this apparatus, the aeronaut is enabled to ascend or descend without loss of ballast or of gas.

[Printed, *1s.* Drawings. See Patent Journal, vol. 3, p. 309.]

A.D. 1848, November 23.—N^o 12,337.

BELL, HUGH.—"Certain improvements in aerial machines and machinery in connection with the buoyant power produced by "gaseous matter."

In the "balloon" motor machine, gas is the suspending power. In the "parachute" motor machine, the motive power is, in part, the supporting power.

The following are the principal points in this invention :—

1st. Metal tubes are used in the framework of balloons, in parachutes, and in aerial machines in general.

2nd. The balloon is made of an elongated form, and has a flexible partition; the said partition is loose, to admit of the full distention of the balloon on one side of it with gas. All the air beneath the membrane may be allowed to escape before the escape of the gas.

3rd. Flat silk bands are used as a network to enclose the balloon, or for strengthening its membrane. A single flat band, attached all round, at the central horizontal line of the balloon, converts the balloon into a parachute in case of accident.

4th. A boat or "life boat" is employed in connection with balloons or aerial machines.

5th. The archimedian screw may be used as a propeller to elongated balloons, or to parachutes. In "the wing propeller," a backward and forward motion in conjunction with a rotary motion is employed. "The double shutter propeller" has a hinge motion. The "umbrella" propeller alternately opens and collapses. The "tail" or rudder has a rotary motion in conjunction with a hinge motion.

6th. The "water grapnel" is employed to arrest the motion of a balloon or other aerial machine at sea; its general form is that of an umbrella; if it is allowed to open, resistance to its passage through the water, and thence to the progress of the

balloon which lowers it, is obtained. By reversing the ends of the water grapnel (ropes being provided for that purpose) it collapses, and can then be hauled up. The grapnel ropes may either be formed entirely of elastic material, or have the said elastic material introduced in its length.

7th. The rope from the "emptying valve" passes through the "safety gas valve" to be within reach of the aeronaut; the "emptying valve" may be worked from the outside. The valves consist of two rings, having India rubber valve surfaces and springs for closing them; a sliding rod or tube enables the valve to be opened.

8th. Rods, free to slide in larger rods that contain long spiral springs, act as "buffers" to break the descent of the apparatus to the ground. In the case of parachutes, the lower ends of the smaller rods carry wheels, "for the purpose of acquiring the necessary velocity in the machine on the ground, in order to make the ascent."

[Printed, 2s. 10d. Drawings. See *Mechanics' Magazine*, vol. 50, p. 501 and vol. 53, p. 75; also *Patent Journal*, vol. 7, p. 91.]

A.D. 1849, February 6.—N° 12,452.

BROWNE, JOHN.—"Improvements in constructing and rigging vessels, and improvements in atmospheric and other railways."

The improvements in rigging vessels, as applied to the wheel-rigged ship, as well as certain improvements in atmospheric railways, are first described.

A "balloon railway" has a line of rails, "by which means a line or chord communicating with a balloon will allow of that line with the balloon attached to travel without impediment, that is, having a line of rail of that peculiar construction that will allow a holder formed of metal or other substances having wheels; the wheels work upwards or sideways, the power being relative instead of downwards; this holder may be made to admit persons riding upon it who may be useful in keeping the rail clear of impediments; to this holder is attached the balloon with its carr of passengers. There may be many ways of constructing the railway." "Sails may be attached to the balloon or holder, with a view of gaining a point or two on the wind. The carr will perhaps have to be made differently to what it is at present, on account of the line, which need not perhaps exceed one hundred feet in length, being attached to the rail.

“ The carr may be more extensive than at present, having an opening in the centre to allow of the line passing through and having liberty to work.”

[Printed, 4d. No Drawings. See London Journal (*Newton's*), vol. 35 (*conjoined series*), p. 111; *Mechanics' Magazine*, vol. 51, p. 142; and *Patent Journal*, vol. 7, p. 183.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 2.—Nº 155.

BROWN, DAVID STEPHENS.—“ An improved means of navigating the water by ships.”

This invention “ consists in sustaining the hulls of ships on the surface of the water when in motion by an upward pressure resulting from such motion, or from other motion or action, instead of allowing such hulls to be sustained in the water by the upward pressure obtained from simple immersion only, the object being to lift the hulls of ships to the surface of the water, or nearly so, with a view to remove or diminish the resistance which they encounter at the bows from the water when in motion.”

The following are some of the means of accomplishing this result:—

By balancing the ship in the water in such a manner that her flat, curved, or angular bottom “ shall form an inclined plane to the surface of the water.” The bottom of the ship is extended beyond the limits of the sides and stern.

By means of an additional bottom, “ placed over the hull of the ship instead of under it,” the air instead of the water acts upon the said additional bottom of the vessel, when it is in motion, “ and inclined as aforesaid, and the best time for thus using it is when she is going against the wind.” The said additional bottom may be suspended by means of pillars below the other,” “ and at a sufficient depth in the water as not to be affected by the waves, and when such additional bottom is used

“ the other bottom and the rest of the hull of the ship may be elevated entirely out of the water.”

“ The ship may be drawn by a rope to which horses are attached, or even kites or balloons, or by sails, or by any other means.”

[Printed, 6d. Drawing.]

1853.

A.D. 1853, January 20.—N° 143.

DE MANARA, HORACE.—(*Provisional Protection only.*)—“ This invention consists in the use and application of balloons to steam boats, sailing and other vessels, for the conveyance of passengers and merchandize,” “ for the purpose of preventing sea-sickness.”

“ These balloons are attached to seats which are supported beneath by a ball and socket joint, and the balloons are inflated with gas or other suitable elastic fluid, by which the seats become suspended, the intention thereof being to preserve a nearly horizontal position of the seats, notwithstanding the pitching and rolling motion of the vessel or boat to which such invention is attached, and thereby to prevent sea-sickness consequent upon such motion.”

The Drawings show a ball-and-socket joint, the socket whereof is firmly connected to the bottom of the boat or vessel in any convenient manner. A platform, carrying seats, is connected to the ball. Bars of iron are securely fixed by their lower ends to the platform; the upper ends of the bars are fixed to a metal ring. The balloon is connected to the ring of the platform by means of a band of silk that carries rings through which sustaining cords are passed, the cords being attached to the ring of the platform. The balloon is steadied by means of a curved iron bar and slotted piece, the bar being fixed to the vessel's sides. The bar has collars, against which metallic pieces abut occasionally. Elastic cords are, at one end attached to the metallic pieces, at the other end to the curved piece. The vertical position of the balloon is thus preserved.

[Printed, 10d. Drawings.]

A.D. 1853, January 24.—N° 179.

JOHNSON, JOHN HENRY, (*a communication*). — “Improvements in aerial navigation, and in the machinery or apparatus connected therewith.”

A platform, suspended from an elongated balloon, contains the machinery and the aeronauts. Paddle wheels, that are fixed at the extremity of horizontal cross shafts, carry blades (or frames upon which canvas is stretched) that are made to swivel by the action of a fixed semicircular guide plate upon a lever attached to the blade, the blade resuming its working position on passing the guide plate, by the action of a spring fixed on the spoke of the wheel; these paddle wheels are driven by steam power, and are used “for the purpose of counteracting the action of the air against the balloon.” Parachute or umbrella-shaped propellers slide upon a longitudinal horizontal rod; when their expanded surface is drawn back, considerable resistance is offered to the air, and thus, by alternate motion, communicated by an eccentric on one of the paddle-wheel axles, the propulsive power is obtained. Horizontal sails, the frames of which carry canvas, are attached to the framework of the machine; to regulate the ascent or descent of the balloon, these may either be extended horizontally or allowed to hang down vertically. Four triangular sails, fore and aft, prevent rolling, and the machine may be made to assume any convenient inclination to the horizon by means of a couple of adjustable weights, travelling upon rollers and acted upon by a cord and winch. The horizontal motion of the machine is governed by means of a rudder.

[Printed, 10s. Drawings.]

A.D. 1853, February 15.—N° 395.

DE NORMANDY, ALPHONSE RENE LE MIRE (*partly a communication*). — “Improvements in the manufacture of articles made of gutta percha.”

This invention consists in “decolorizing gutta percha by means of animal charcoal,” and in “the manufacture of films or layers of gutta percha.”

The peculiar action of the charcoal is brought to bear upon the gutta percha in a state of solution, by means of a filtering apparatus that prevents the action of the air upon the solution.

To form a balloon, a certain quantity of a solution of gutta percha in bisulphuret of carbon is poured into a suitably-shaped vessel. The vessel is then inclined and turned "in every direction until its sides are completely and evenly smeared over internally by the solution;" the excess of solution employed is drained off by holding the glass vessel with its mouth downwards. "In a short time the sulphuret of carbon volatilises completely, leaving the inside of the glass covered with a thin layer of gutta percha. The contraction resulting from the drying of that layer loosens it, and it may then be readily extracted." When the gutta percha membrane has to be removed through a small aperture, a tube must be introduced into the vessel in order that the air may be sucked out. By this means the gutta percha membrane is made to recede from the sides of the vessel, and may then be easily removed therefrom.

[Printed, &c. Drawing.]

A.D. 1853, May 4.—N° 1088.

GIANNETTI, JEAN BRANDO. — "Applying the ascensional force of balloons to various useful purposes."

The Provisional Specification sets forth:—"The disposable ascensional force which is afforded by balloons suitably prepared has not hitherto been applied" "to elevate in the air certain bodies more or less heavy, such as boats laden with one or more travellers, &c." Certain applications are then mentioned, such as the raising of ships from the bottom of the sea, the prevention of the foundering of a vessel, the transport of heavy bodies resting in water," and "the use of balloons for obtaining motive power." "Carbonic acid gas or other suitable gas, hydrogen, for instance" may be employed to inflate these balloons.

In the Final Specification it is stated that the invention "consists in novel applications of balloons immersed in liquids," and that in this invention "generally, balloons immersed in a liquid" are employed. An apparatus for generating carbonic acid gas is described and shown; sulphuric acid and "a carbonate" are respectively introduced into the separate chambers of a box, fitted with suitable taps for admitting and mixing the ingredients and for supplying the gas to the balloon; this apparatus is placed at the bottom of the water when weights are to be raised, and the cock for admitting the generating materials to each other may be

actuated from the surface. Two balloons, alternately inflated at the bottom of the water, are used to produce motive power.

[Printed, &c. Drawing.]

1854.

A.D. 1854, January 30.—N° 224.

ALDBOROUGH, BENJAMIN O'NEALE STRATFORD, Earl of.
—"Improvements in aerial navigation."

The principal points of this invention are:—

1st. "The construction of wings with a horizontal tail or rudder, "the stems or bases of which are set under springs, and which "act on the air by the recoil or reaction of these springs;" also "the construction and use of" "oars," and of "alæ spurisæ," these are raised "more slowly than they strike downwards." The action of the wings is assimilated to the motion of birds' wings, and the principle and construction of the apparatus is based upon the supposition that the birds' wings compress the air by percussion and force it under the concave part of each wing.

2nd. The "aerostat" or envelope containing gas. This is formed of various shapes according to the purpose for which it is required, the cross section at right angles to the motion (whether horizontal or vertical) being small and gradually approached to from a pointed or nearly pointed stem. The aerostat is used in conjunction with the other parts of the invention.

3rd. Vacuum chambers are placed so that they may be acted upon by currents of air on their under and hinder surfaces. "Medium" chambers, containing a denser medium than the vacuum chambers, may be above the vacuum chamber.

4th. A "pilot boat" descends before the vessel and brings it down safely. The pilot boat is ordinarily attached to the hull, and has a vacuum chamber and stove.

5th. "The construction of a landing place for aerial ships, "with a railway conducting from thence to a building capable of "receiving them."

In this very long Specification many details are given (both by description and by Drawings) of the construction and methods of imparting motion to the wings, tail, &c. of the apparatus; also

the use and working of the vacuum chambers and of the pilot boat are described at length.

[Printed, 6s. 2d. Drawings.]

A.D. 1854, April 3.—N° 759. (* *)

BOBCEUF, PIERRE ALEXIS FRANCISSE.—(*Provisional Protection only.*) “The application of electricity and fixed or moveable “aerostation to military strategy and pyrotechny.”

This invention consists :—

1st. “In the employment of fixed or moveable balloons, retained “by ropes enclosing wires for conducting electricity, and which “may be put in communication with electric telegraphs, operating “so as to obtain the instantaneous transmission of observations “or orders necessary for directing the balloon, or loosening & “inflaming the hostile matters raised by the balloon.”

2nd. “In the employment of the gas used for inflating the “balloon to the projection of missiles by the means of a compressing apparatus.”

3rd. “In the isolated, simultaneous, and instantaneous inflammation of the explosive matters used in pyrotechny by means “of the electric battery.”

[Printed, 4d. No Drawings.]

A.D. 1854, June 2.—N° 1224.

ALDBOROUGH, BENJAMIN O'NEALE STRATFORD, Earl of. —“Improvements in locomotion on land and water, part or parts “of which are applicable to the raising of weights and the working of machinery.”

This invention relates to the adaptation of the principles and combinations set forth in N° 224 (A.D. 1854) to marine navigation, to locomotion, and to general purposes. The improvements are :—

1st. “The adaptation of wings, and also of a winged aerostat,” to navigation and to locomotion generally. The aerostat is preferably filled with air and is furnished with a vacuum chamber or chambers and with a medium chamber, “the external air being “made to act forcibly against such part or parts of the surface or “surfaces of the vacuum chamber or chambers or of the aerostat “as may be suitable, according to circumstances, by the action of “the wings.”

2nd. The forms of the hulls of vessels for marine navigation; an improved form of propeller acting also as a rudder; and "the use of elastic heads." The bottom of the vessel is formed of twin hulls, the bottoms of which are covered with planks which form the channel; in some cases a third flat-bottomed hull rests on the top of the channel to nearly half its length. The propeller or rudder is elastic. The elastic heads are formed of similar materials to the propeller, namely, elastic wood.

3rd. The application of vacuum and medium chambers to raise weights, to diminish gravitation, or to work machinery. The balloons may rise and fall alternately, the air being exhausted from the vacuum chamber of one of them; the fanners impel the air against the lower surface of the exhausted vacuum chamber. The disposition of the other balloon and fanners is such that the pressure in the surface of the vacuum chamber acts downwards.

[Printed, 1s. 10d. Drawings.]

A.D. 1854, June 19.—N° 1334.

DARTIGUENAVE, PROSPER GUILHAUME.—(*Provisional Protection only.*) "Improvements in aerial navigation."

"I make use of two apparatuses, or two sets of apparatuses, similar to parachutes, one over the other, to rise up into the air, and I effect the rising by alternately pushing and pulling these apparatuses up and down. I propose to work these parachutes by steam or other suitable power. When the desired elevation has been attained, I direct my machine by means of a horizontal flapper fixed upon a centre, and which may have an upward or downward inclination given to it by means of rods or cords under the command of the aéronaut. My machine is also provided with wings, the better to enable it to turn, and which can have their direction changed at will of the aéronaut."

[Printed, 4d. No Drawings.]

A.D. 1854, November 18.—N° 2447. (* *)

LUFF, HENRY JAMES.—(*Provisional Protection only.*) "Improvements in the mode of attacking hostile bodies, also applicable to the obtainment of plans of forts."

These improvements "consist in the mode of attacking hostile forts and towns, or bodies of troops when stationed near to the

“ sea, by having, in connexion with a vessel at sea or in a harbour, a balloon having a telegraphic communication with such vessel, such balloon being freighted with explosive compounds of any description most suitable with the purpose. The balloon having ascended from the vessel, and being then in connexion therewith, can readily direct the movements of such vessel, whilst such movements by suitable connexions can again operate in the position of the balloon, so as to bring the same readily into the most favorable position with regard to the fort, army, or other object to be acted upon, when the explosive compounds may be easily let down in the exact position where the greatest injury can be inflicted. It is also to be observed, that by similar means, plans of fortifications, &c., may readily be acquired by the photographic process. It is obvious, that where inland forts or armies are to be attacked, the balloon may be in connection with any apparatus upon land, so as to effect the same results.”

[Printed, 4d. No Drawings.]

1855.

A.D. 1855, January 26.—N° 206.

JOHNSON, JOHN HENRY (*a communication from André Marie Préverand*).—“ Improvements in the construction of kites, and in the application thereof to the purposes of carrying lines and of signalling.”

These kites are constructed so as to be easily folded or extended when required. The main cord is attached to the kite at different points of the belly band, according to the strength of the wind. A float is attached to kites, whereby they are enabled to travel in an oblique direction with the wind. Kites may be used wherein the cloth is not stretched tight; by this means a better action of the wind is obtained. Kite tails are employed that are composed of a number of pallets or discs.”

The frame of the kite is composed of two straight flat laths of wood “ laid one over the other and crossing at their centres, where they may be secured either by a knotted cord or piece of wire,” so that the two laths may be “ shut up together parallel when

"not required for use." The sail portion of the kite is secured permanently to one of the laths at each end, whilst it is merely attached temporarily to the two extremities of the other lath. The tail is composed of a number of thin boards, through the centre of which is passed the tail cord. A tow line is conveyed by this kite by attaching one end of the said tow line to a float, to which float the main line of the kite is fastened. For signalling purposes the requisite signals are attached to the body of the kite.

[Printed, 8d. Drawing.]

A.D. 1855, March 20.—N° 625.

ALDBOROUGH, BENJAMIN O'NEALE STRATFORD, Earl of.
—"Improvements in aerial navigation, and in the application of
"the same to warlike purposes."

This invention relates to, 1. The construction of aerial vessels.
2. "The application of aerial navigation to the purposes of war-
fare." 3. "The construction of fortified ports or landing-places,
"with harbours for aerial vessels."

The construction of the aerial vessels is based upon principles (and the details of the said construction form improvements upon machines) that are mainly described in No. 224 (A.D. 1854).

The shape of an "aerostat" for perpendicular ascent is made externally nearer to that of ordinary balloons.

The lower part of the expanded portion of a parachute is flat, and the said expanded portion may have a "flying" motion.

A "locomotive" aerial vessel is described in which the aerostat, by its motion, performs the office of a pair of wings.

Aerostats are described and shown whose inclination is capable of being altered with respect to the hull.

An aerial vessel with air channels in which the aerostat revolves on its longer axis by means of an endless band.

An "arrow head" for the front of the aerostat with aperture and elastic springs.

A fortress to receive aerial vessels, with a removeable entrance which is also the roof.

A fortress for aerial vessels, so placed as to protect a town from attack by hostile aerial vessels. An engagement between the respective aerial vessels is represented, and the method of attack and defence is described.

Other warlike manœuvres with aerial vessels against land or sea forces are described in this lengthy Specification.

[Printed, 8s. 2d. Drawings.]

A.D. 1855, May 21.—N° 1136.

CURTIS, WILLIAM JOSEPH. — (*Provisional Protection only.*)

“Improvements in aerostation or aeronautics and the mechanism connected therewith, which improvements may be rendered subservient to purposes of navigation.”

“This invention consists in employing the vapour or gas of gunpowder or similar compound to inflate balloons; also connecting with balloons kites or wings, to be acted upon by suitable cords or connections, so that the motions of the balloons and kites may be governed by operators stationed beneath the same on land or water. When applied to a ship, these balloons and kites may be used to propel or navigate same. These balloons and kites may convey missiles, &c., which may be discharged by means of an electric spark sent along the cords or connections; or the discharge may be effected at a given time by clockwork attached to the balloon.”

[Printed, 4s. No Drawings.]

1856.

A.D. 1856, September 4.—N° 2062.

ALDBOROUGH, BENJAMIN O'NEALE STRATFORD, Earl of.

“Improvements in aerial navigation, and in the apparatus connected therewith, parts of which are applicable to locomotion generally.”

This invention comprises improvements upon machines set forth in No. 224 (A.D. 1854) and in No. 625 (A.D. 1855).

1st. Furnishing to aerostats outer compartments with valves opening inwards. The said compartments are thus in connection with the external air, and can resist external pressure.

2nd. The use of two or more air channels (within the aerostat, and inclined to its central line) to steer the aerial vessel. Twin aerostats are described and shown that act as wings.

3rd. The addition of curtains "to preserve the more delicate parts of the apparatus from injury."

4th. Springs are applied to the basal parts of the wings proper to cause them to strike downwards against the air. In regard to the basal portion of each wing, the humerus is inclined more forward than that of a bird's wing. There are also improvements in the ribs, shafts, oars, propellers, and stays (of India rubber) of aerial machines. Valves and sliding retractile tubes are used in connection with a magazine of compressed air. "The spring of the air within, when permitted to act as the wings strike downwards, tends to increase the force with which the wings strike against the external air."

5th. The use of two pilot boats, instead of one only, to effect the landing of the aerial apparatus. Elastic cables are used in connection with suitable anchors or grapnels.

6th. Rotary aerostats. The aerostat revolves freely on a shaft composed of "a combination of canes, or bamboos, with wooden rods or tubes, strengthened by steel rods."

7th. Application of the aforesaid improvements to locomotion generally. Air channels and twin aerostats (either with or without a third aerostat) may be applied to navigate the water and to raise vessels from the water. With the exception of the improvement relating to pilot boats and to elastic cables, the whole of the above improvements may be applied to locomotion generally.

This Specification contains many details that are only generally alluded to here. Fourteen sheets of Drawings are appended to a very lengthy description.

[Printed, &c. Drawings.]

A.D. 1866, September 15.—N° 2154.

LASSIE, JEAN BAPTISTE JUSTIN. — "A new system of aëria navigation."

"This invention consists in an improved aerial ship or carriage, constructed with an outer and inner cylinder on an axis, so that the crew or passengers, by walking inside the inner cylinder supported by gas, cause it to rotate, and with it the outer cylinder, furnished with a screw, and thus propel the vessel in the air."

It is proposed that the outer cylinder be ninety feet diameter and nine hundred feet long, and that a crew of three hundred men be employed to work the apparatus, one hundred and fifty in action at a time.

At each extremity of the ship, a balloon is fixed to the central axis, round which the screw revolves; a "cut-wind" of an angular shape is fixed to the fore balloon, and the aft balloon is provided with two vertical blades and with a means of obtaining lateral motion to steer the vessel.

A metal counterpoise, sustained by two lines of iron wire, regulates the angle of inclination of the vessel to the horizon, a reel at each end of the aerostat determining the position of the counterpoise.

The space between the internal and external cylinder is filled with gas. Small balloons that occupy compartments in the said space may have air pumped into them, and thus the descent of the aerostat may be accomplished.

The pumps are formed similar to bellows in the framework of the internal cylinder; they may be worked by the treading of the crew.

[Printed, 1s. 4d. Drawings.]

A.D. 1856, September 26.—N° 2256.

PELLEN, MARIUS. — "Rendering impermeable by gas caoutchouc, gold beaters' skin, paper, gauze, and similar materials used for things adapted to receive an ascending force, such as balloons, aerostatic machines, toys, &c., &c., by the application of a peculiar varnish."

"The caoutchouc prepared in England is particularly applicable for making these kind of balloons, but it must first be submitted to the vulcanizing process."

"The different kinds of varnish employed are composed of amilacious substances, such as enulin, of lichnin" [lichenine?] "of gum arabic, of adragant, of musilage" [mucilage?], "and vegetable substances, mixed with some kinds of gum, of sugar, gelatine, dextrin, of glucose, of albumen, of collodium" [collodion?], "submitted to a certain preparation without ether of gelatinous matter, that is, of pure gelatine of fish skin and of glue. These different kinds of gum are prepared with pure water diluted with alcohol." The varnish is spread on the balloons "after they have been properly distended with gas."

To fill the balloons, the pressure of the gas is regulated by weights upon a gas holder, and is shown by a pressure gauge.

A piece of unvulcanized India rubber is introduced into the mouth of a balloon before inflating it; when the inflation is completed the mouth is tied round with waxed thread; or the long mouth of the balloon may be stretched and tied into a knot.

By means of this invention toys may be made whose weight is nearly that of air.

The varnish can be employed to coat the inside of large balloons.

[Printed, 4d. No Drawings.]

A.D. 1856, December 17.—N^o 2993.

CARLINGFORD, GODWIN MEADE PRATT SWIFT, Viscount.—

“An *aërial* chariot, or apparatus for navigating the air.”

“The *aërial* chariot, in form is something of the shape of a boat, extremely light, with one wheel in front and two behind, having two wings, slightly concave, fixed to its sides, and sustained by laths of a half hollow form pressing against them, and communicating their pressure through the body of the chariot from one wing to the other, and supported by cords whose force, acting on two whoops nearly of an oval shape, hold the wings firmly in their position.”

A tail can be raised or lowered at pleasure by means of a cord.

The chariot is drawn forward by an “aerial screw” in front thereof, “which screws into the air at an elevation of forty-five degrees, similar to the bird’s wing; and is turned by means of a winch acting on three multiplying wheels.” This screw “is known as the Carlingford screw. The blades of this screw become more straight as they approach the centre, or, in other words, their edges become more direct towards the centre.”

A rudder is worked at its distant extremity by a cord that communicates into the chariot.

To start the apparatus it is preferred to suspend it by ropes between two poles, and then allow it (by drawing a trigger suddenly) to fall upon the air and to be drawn “forward with great velocity by the falling of the weight in front,” the said weight being shown as a portion of the tackle. This first

impetus "is easily sustained and increased by turning the aerial screw, while the two ropes falling from the crooks leave the chariot in perfect freedom."

"When a certain altitude is attained the chariot may go several miles, perhaps fifty or sixty, as it were, upon an inclined plane of air."

[Printed, 10d. Drawing.]

1857.

A.D. 1857, April 14.—N^o 1054.

ALDBOROUGH, BENJAMIN O'NEALE STRATFORD, Earl of.
—"Improvements in aerial navigation, and in the apparatus connected therewith, parts of which are applicable to locomotion generally."

This invention consists in improvements on the inventions described in Nos. 224 (A.D. 1854), 625 (A.D. 1855), and 2062 (A.D. 1856).

1st. Utilizing the weight of aeronauts, crew, or cargo to actuate aerostats (the portions of the apparatus that contain gas), wings, or propellers. The aerostats may either have a vibrating or revolving motion. The motion may be communicated by inclined planes properly pivoted, or by apparatus fitted with cords and springs that may be made to oscillate by the alternate action of aeronauts, &c. properly placed.

2nd. "Starboard" and "larboard" air channels, with the external air admitted to them alternately, may be used, in conjunction with the before-mentioned weight, to actuate aerostats, &c.

3rd. The hulls or cars of aerial vessels may be constructed of the form of twin hulls for water navigation, see No. 1224 (A.D. 1854). The vanes are formed with an increased inclination at the hinder part, and have valves adapted to them. Rotary aerostats are constructed with oblique air channels between each of the vanes. Curtains are adapted to certain aerostats, to be drawn over the fore aperture of the main air channel. Retractable tubes (with or without a plank) are used to prevent injury on descent. The frame for a single aeronaut is

formed of a number of steel pieces that can be bolted together or taken to pieces.

4th. Uniting aerostats to ships or locomotives, the apparatus for utilizing weight being placed on the ship or locomotive. No. 1224 (A.D. 1854) is alluded to in this part of the invention.

[Printed, 2s. 6d. Drawings.]

A.D. 1857, June 5.—N° 1581.

CLAIR, JOSEPH ETIENNE MARIE JEAN (*a communication from Joseph Robatel*).—(*Provisional Protection only*.) "Certain improvements in propelling on water and in the air."

"This invention consists in the employment of two hollow barrels, made tapering towards both ends, and surrounded by screw vanes or threads. The barrels are placed on each side of a vessel or stage carrying a steam engine or other motor; rotary motion being communicated to the screw barrels, causes them and the vessel to which they are connected to advance."

[Printed, 4d. No Drawings.]

A.D. 1857, September 26.—N° 2483.

BALBONI, PASCAL. — (*Provisional Protection only*.) "A marine, submarine, and aerostatic propeller, being a new mechanism for propelling steam vessels on and in the water, applicable also to aerostatic purposes, combining speed and safety in steamboats, and giving the power of directing balloons."

This invention consists in "a new propeller intended to supercede the paddle wheel and screw now used in steam vessels." The name of the propeller is "aile nageoire or fin."

The Drawings represent this fin as having a vibratory up-and-down motion on an axle parallel to the length of the vessel, as well as a rotary motion on a transverse axis. Crank and spur wheel gear give the rotary motion; and a pendulum, worked by a cam, gives the up-and-down motion through the intervention of a rack, spur wheel, and toothed segment. "This propeller is in the form of an isosceles triangle." "The axle has a longitudinal opening in which the propeller slides backwards or forwards and forms a fin."

Several of these fins may be worked together; they strike the water in the same manner as a boatman would do with the blade of his oar. "At each half turn of the axle the fin turns with it, and when the fin is in a horizontal position, instead of completing the circle it receives a sudden lateral impulse from the machinery, and slides with velocity between the opening in the axle, and at once plunges again into the water, thus propelling the vessel with rapidity as the action is alternately renewed."

[Printed, 6d. Drawing.]

1859.

A.D. 1859, October 12.—N° 2330.

BRIGHT, HENRY.—"Improvements in machinery or apparatus for navigating the air."

"A suitably constructed car rests upon a plate connected to the lower end of a vertical solid or tubular shaft, which is fitted at the top with a number of sails working horizontally, set at a suitable angle, somewhat similar to the sails of a windmill." "Immediately under the above set of sails is placed another and similar set of sails connected to an outer hollow shaft through which passes the one before mentioned. In addition to the said plate, at the bottom of the shaft on which the car rests, a plate is also fitted to the outer tubular shaft from which the car is suspended. Each of these plates is provided with a set of friction rollers upon which the car is borne above and also at the bottom. For the purpose of imparting motion to the sails, horizontal toothed wheels are keyed, one to the inner and another to the outer shaft gearing into a vertical wheel keyed on a crank shaft (fixed within the car) which may be worked by the aeronaut or other convenient means. When the machine is set in motion, each set of sails is caused to rotate in an opposite direction to the other set;" the car "is thus kept from gyration." To raise the machine, if the top set of sails rotate to the right, the lower set rotate to the left; to cause its descent the action of the crank shaft, and consequently the sails, is reversed." Modifications of the above arrangement may be made.

The Drawings show an elevation of the apparatus with the car in section ; also a plan of the top set of sails.

Screw rods for adjusting the car on its bearings, and an ordinary wind vane attached to the car, are also shown.

[Printed, *ed.* Drawing.]

1860.

A.D. 1860, February 29.—N° 561.

SMYTHIES, JOHN KINNERSLEY.—“ A flying engine.”

This apparatus has a seat for the aeronaut attached to extended plane surfaces ; it is propelled by the alternating motion of wings that are actuated by a boiler and engine of a peculiar kind.

The vapour from a heated volatile liquid passes through wire gauze, and, having been mixed with air, is burnt in a “ flame chamber,” and supplies heat to a boiler with a number of small vertical tubes. The whole engine is enveloped in varnished silk, and the condensed steam runs into a reservoir, whence it is pumped up into the boiler by a feed pump. To the end of the piston of an ordinary steam cylinder two levers are pin jointed ; these levers, in conjunction with links and a cross piece, actuate rods that belong to the wings. The wings are under the governance of the aeronaut by means of cords. The seat of the aeronaut is suspended from the cylinder. The whole of the flying engine, except the wings, seat, and oil reservoir, is enveloped with oiled silk stretched out in a wide flat form ; the steam is confined in this casing. An interior envelope of oiled silk surrounds the boiler and steam cylinder, and fits closely to the before-mentioned envelope at top ; it extends to the bottom of the boiler and cylinder, and is there left open.

The apparatus is guided by shifting the relative positions of the centre of gravity and centre of pressure of the wings. Elastic legs break the fall on alighting.

Modifications of the apparatus and different details of construction may be adopted, provided the principles above set forth are adhered to. The engine may also be adapted to carry several passengers.

[Printed, *2s. 4d.* Drawings.]

A.D. 1860, May 3.—N° 1114.

HENRY, MICHAEL (*a communication from Louis Coignard*).—
 “Improvements in the mode of and apparatus for propelling,
 “turning, and changing the direction of ships, balloons, and
 “other bodies.”

Propulsion is effected by driving a fluid into a tube or channel connected to the body to be propelled. In its exit from the tube the fluid presses forcibly against the internal side of the said tube, and, by reaction, motion is communicated to the body “in a
 “rectilinear direction opposite to that in which the fluid is
 “ejected.” One or more tubes may be placed in any convenient part of the body to be moved; “two propeller tubes at the stern,
 “one at each side of the rudder, is thought an advantageous
 “arrangement.”

“The propeller tubes or channels may be so constructed as to
 “turn on their axes wholly or partially round in order to turn
 “or change the direction of motion of the ship or body to which
 “they are attached.” The fluid may be supplied to the propeller tubes in a continuous or in an intermittent flow.

The invention “may also be applied to balloons or vessels for
 “aerial navigation, using air instead of water as the fluid to be
 “forced through the propeller tubes. The tubes need not be
 “cylindrical or of equal diameter throughout, but may be spread
 “into a conical or bell-mouth shape towards the exit, and tubes
 “coiled spirally may, it is thought, be employed with advantage
 “for air.”

[Printed, 8d. Drawing.]

A.D. 1860, May 10.—N° 1155.

BOYMAN, RICHARD BOYMAN.—“Improvements in applying
 “steam or other expansive prime movers by action and reaction
 “for rotary motion and propulsion, and in the machinery for the
 “purpose.”

This invention may be applied “by reaction for the propulsion
 “of vessels, locomotives, and *aërial machines*.” The following remarks, relating to *aërial navigation*, also occur in this Specification:—“The laws of motion, applied to a few grains of steam
 “give it a force sufficient for all the great purposes of propulsion
 “at sea, on land, and in the air.” “The principle of reaction
 “will be the only method of propulsion on land, water, and in
 “the air.” “Intermittent reaction propulsion is the foundation

" of the science of aerial locomotion against the strongest hurricanes."

The invention consists in the application of " the intermittent, instead of continuous force of steam, or other expansive prime movers, by impulse or action for rotary motion, and for reaction for propulsion, without the usual engines and propellers." The novelty consists :—1. In the intermittent force of steam, &c. by " action or impulse into the buckets of a wheel, to obtain continuous rotary motion." 2. " In applying the same invention by reaction for the propulsion of vessels, locomotives, and " aërial machines." No description is given of an apparatus suitable for propelling aërial machines. 3. " By such novel combination of proportionate areas, number of issues, puff chambers, piston puff valves, parts, and machinery, as will " make an expansive prime mover economically available by " action and reaction, especially for reaction propulsion, without " the usual engines and propellers."

In applying the said intermittent force, 1st, the steam must be prevented expanding until it issues, by means of " puff chambers," " to hold the required quantity of steam for each issue ;" 2nd, " every issue or puff valve must open all at once." " The puff chambers will be placed in the funnel horizontally near the exit " of the heated air, arranged for the steam to act as a blast." " A donkey engine or two will work the chamber valves and feed " the boiler."

The principal features of the machinery are :—

1st. " Steam spring equilibrium reciprocating valves and reaction chamber." In connection with these there may be a " cut-off valve and measuring chambers."

2nd. A " cam crank."

3rd. A " steam equilibrium rotary valve and reaction chamber," with and without " circular cut-off valves and measuring chamber."

4th. A modification of the 3rd feature, "for the locomotive wheel application, and for driving the rotary steam wheel."

5th. "Two donkey engine applications of intermittent reaction ;" also a method of " backing the train or vessel."

6th. " Two regulator locomotive wheel applications."

7th. A method of " working the impulse valve of a rotary wheel " from its axle to regulate the quantity of force."

[Printed, 3s. 4d. Drawings.]

A.D. 1860, July 3.—N° 1598.

STEVENS, CHARLES (*a communication from C. F. Rablat*).—
“An improved navigable balloon or aerostatic ship.”

This invention consists of a balloon with wings and steering apparatus. The car “serves also as boat on descending on water.”

The upper edge of the car is furnished with a waterproof cloth, which, being filled with air, renders it “almost impossible to upset.” The shock on touching the ground is deadened by springs at the bottom of the car.

Gear and motive power:—A fly wheel makes three quarters of a revolution from right to left and left to right, and thus actuates the wings. Any suitable motive power may be employed.

The wings are wooden rods coated with waterproof tissues and elastic bands, forming together compartments or valves; the valves open when the wings rise and close when the wings descend.

A head and stern rudder of waterproof fabric, with cords and pulleys, serve to guide the “ship.” The head rudder guides horizontally and “perpendicularly;” the stern rudder guides obliquely.

When the gas expands, “pockets” attached to the compartments of the balloon receive it, and restore it upon descent. The balloon is divided into four compartments; “these several compartments add greatly to the security, as, on the gas escaping from one or more by accident, the other balloons with the wings, which form a parachute,” render the descent quite free from danger.

According to a modification of this invention the balloon may be omitted, and the wings only used.

[Printed, 10d. Drawing.]

A.D. 1860, December 18.—N° 3103.

SILAS, FERDINAND.—(*Provisional Protection only*). “An aerostatic signal apparatus to be called ‘semasphere.’”

“This invention relates to the application of a new process, by means of balloons raised to a certain height, and secured to the ground or other objects by means of ropes or cables, on which lamps or other signal lights may be fixed, so that when in a

“ certain position both their numbers and colours may represent certain signals.”

Any powerful light, such as the electric light or the lime light, but especially that by “phosphuretted hydrogen,” may be adapted to the semasphere. Kites or parachutes of various forms may be employed to steady the balloon. “One of the principal applications of the semasphere consists in illuminating the balloons by means of powerful reflectors, mirrors, or lenses, so as to produce a luminous sphere by means of which the number and form of the aerostatic apparatus can be ascertained at great distances.” “The aerostatic apparatus may assume various forms, so as to produce different signals by their combination, either with or without the aid of light. The balloons may be constructed of different materials, they may be either metallic or made of silk, leather, india-rubber, gutta percha, pasteboard, parchment, animal or vegetable tissues. All those materials can be covered in and outside with a layer of liquid glass, (silicate of potash, soda,) or any other silicate which renders them impermeable.”

The semasphere may be used “whenever a powerful light is required;” it may also be employed as a day signal, and to serve as a lightning conductor.

[Printed, 4d. No Drawings.]

1861.

A.D. 1861, February 26.—N° 492.

JAMES, WILLIAM HENRY.—“Improvements in the means or apparatus for taking or catching of fish, parts of which improvements are applicable to propelling, and to arresting the progress of ships and boats, and to the forming of communication therefrom to the shore.”

1st. Employing bags or “balloons,” inflated with air and ballasted with water, to catch fish, &c. by dragging or trawling nets or ropes. Also the use of reels, upon which the ropes are wound. Spring valves are in connection with the said balloons, to liberate some of the contained air in case of a rough sea.

2nd. The employment of fixed windlasses for the dragging

of nets, &c. to and fro. Pulleys are attached to buoys, &c., which are connected by ropes to chains connected with mooring blocks, so that fish may be caught without the use of boats.

3rd. The application of the said balloons to drag or unwind a rope coiled upon reels, so as to form a communication between a wrecked or stranded ship and the shore.

4th. The mooring blocks, chains, cables, buoys, &c. already alluded to, may be placed parallel to the shore at "the distance of a mile more or less," so as to form a means of safe anchorage to ships in stormy weather, and serve as a harbour of refuge.

5th. Parts of this invention are also applicable to propelling or dragging small vessels, &c. off the rocks, through the surf, "as well as for dragging vessels of any kind on or through the water by means of the inflated bags or air balloons, and ropes and lines before mentioned," "in lieu of or in conjunction with sails or other means of propulsion."

[Printed, 10d. Drawings.]

A.D. 1861, March 9.—N^o 593. (* *)

JACOB, JOSEPH (*a communication from Carl Preisenhammer and Carl Weniger*).—"Improvements in the mode of, and apparatus for, obtaining gas and the application thereof for domestic, manufacturing, and other purposes."

The invention relates to the production of pure hydrogen gas. "One method of producing this gas which has hitherto been only demonstrated experimentally in the laboratory, consists in passing steam through a tube or pipe which contains small quantities of iron in the form of borings or filings."

According to the present invention, steam is sent through a series of retorts filled with the filings and heated to a red heat; the hydrogen gas liberated is conducted by pipes into a receiver or holder. After a sufficient supply of hydrogen gas has been produced, it is intended to use the same both under the retorts and under the steam boilers in place of or together with other kinds of fuel.

Further improvements on this invention are described in the Specification of No. 2377, September 23, A.D. 1861, wherein mention is made of the use of "hydrogen gas, produced as described," "for the filling of balloons."

[Printed, 6d. No Drawings.]

A.D. 1861, August 3.—N° 1929.

PONTON D'AMÉCOURT, GUSTAVE LOUIS MARIE, Viscount de. — "Improvements in apparatus connected with aerostation."

This invention consists in "imparting to aeronautical apparatus of a specific gravity exceeding that of the air, and by means solely of any suitable prime mover, such as a steam engine or others, the ascending power required for causing the said apparatus to rise in the air by the effect exerted on this latter by suitable revolving helices, propelling blades, or vanes, or other suitable mechanical arrangements acting in so far in a contrary direction to each other as to cause the vertical components of their forces" [to?] "unite their efforts for rising the apparatus, whereas the horizontal components keep each other in proper equilibrium, and thus prevent the apparatus from taking a giratory" [gyratory?] motion, "whilst one or more revolving helices, propeller blades, or vanes, or other suitable mechanical arrangements are made use of for propelling, and one or more rudders, wings, or other suitable devices for directing the apparatus."

The Drawings show a vertical shaft, which sustains a small steam engine and the aeronaut's seat, and which has slits or forked parts that carry the pulleys, by means of which the motive power is communicated to two toothed wheels that actuate the helices. The toothed wheels revolve upon a horizontal axis between the helices, and gear with a toothed face wheel on each of the helices, thus imparting rotary motion to them in contrary directions. Other means (such as a hollow shaft and bevil wheels) may be used to obtain the same result. The inclination of the blades of the helices is adjustable. A propeller helix revolves on a horizontal axis; also a vertical rudder ("in the manner of a fish tail"), and a horizontal rudder ("in the manner of a bird's tail") are provided.

[Printed, &c. Drawing.]

A.D. 1861, September 23.—N° 2377.

JACOB, JOSEPH (*a communication from Carl Preisenhammer and Carl Weniger*).—"Improvements in the mode of and apparatus for obtaining and treating hydrogen gas, and the applica-

"tion thereof to various purposes, parts of which improvements
"are applicable to the manufacture of iron and steel."

This invention consists in improvements upon, and new features connected with that set forth in Specification No. 593, A.D. 1861. The hydrogen is obtained by passing steam over iron in a finely divided state, and heated to a red heat. The oxides of iron resulting from this process may be employed with advantage in the manufacture of iron and steel; various modes of effecting this object are described.

The hydrogen gas "can be employed for lighting and various heating and manufacturing purposes." Many applications of hydrogen gas to these purposes, and the methods of application, are treated of in detail. From the retorts the hydrogen gas is conducted to the condenser, which is so arranged "that the gas comes uninterruptedly in contact with water." A flow of water is provided for this purpose.

An illuminating gas is produced "by mixing such gaseous compounds which contain an excess of carbon with the hydrogen gas."

"I employ hydrogen gas produced as described, as well as the compound of the hydrogen with the illuminating gas for the filling of balloons."

[Printed, 8d. No Drawings.]

A.D. 1861, September 27.—No 2420.

PHILLIPS, JOSEPH SCOTT.—(*Provisional Protection not allowed.*)
This invention is for "enabling mankind to fly through the
"air."

"Its principle is contained in the propulsion of a plane against
"the atmosphere by means of wings shaped like the hoof of a
"calf, (or any other animal) affixed to large light wheels, and
"made of firm or loose flapping and bagging material, the said
"plane being formed of wooden or iron framework stretched with
"silk, or sailcloth, or other light material. These winged wheels
"being caused to rotate by a spring in a model, or by the hand,
"or by steam machinery, will flap as they revolve, and renew an
"impulse on the air compressed by the plane faster than the said
"air can possibly recede from the pressure, and therefore all
"details being properly proportioned to the weight to be carried,
"the machine with whatever it contains will necessarily be
"upborne by the air.

"The chief peculiarity of this my invention lies in the bagging and sagging hoof-shaped wings, which in rotating through a current of air bag and press on one half of the circle of rotation, and sag or flap flat as they pass through the other half. Thus obtaining what has never been had before, a wheel rotating with wings in the air pressing on one half of the circle, and non-resisting on the other."

[Printed &c. No Drawings.]

A.D. 1861, October 10.—N° 2529.

BROWN, DAVID STEPHENS. — (*Provisional Protection only.*)

"Certain improvements in propelling and sustaining balloons and aerial machines in the air."

"The employment of ammonia and carbonic acid to work engines, similar to steam engines, for the purpose of giving motion to fans like screw propellers, with a view of propelling and sustaining balloons and aerial machines in the air." The ammonia and carbonic acid, in the liquid or solid state, are placed in tubular condensers. The condensers are suspended from the balloon so that they drag behind upon the propulsion of the apparatus. The gases thus produced are used in the engines, then injected into separate receptacles in the balloon, the hydrogen or other gas being allowed to escape to make room for them. When the voyage is completed, the gases are to be pumped into condensers, so that they may be used over and over again.

The balloon is oblong, the condensation of the gas in it is purposely sufficient to make it rigid enough to support a propeller in front and a rudder behind. The rudder acts vertically as well as horizontally.

"When the sustaining power is obtained by mechanical action two horizontal fans or screws are to be placed above a car formed like a life-boat or canoe." Springs and the before-mentioned gas engine supply the power. A vertical screw propeller is placed at one end of the car, a rudder at the other.

The car, of inflated air-tight cloth, has rigidity given to it by means of condensed air or gas. The fans (made of cloth) are held in position by rings rendered rigid by condensed air or gas.

"The changes of temperature and atmospheric pressure, that
" will be encountered by the machine " "are to be made available
" in augmenting the motive power."

[Printed, 4d. No Drawings.]

1862.

A.D. 1862, June 17.—N° 1786.

CRESTADORO, ANDREA. — "Improvements in obtaining
" and applying motive power from rarefied air and from aeriform
" fluids."

In this invention motive power is obtained from "the air-
" sucking property of fire," all access to the furnace from the
outward air being closed, except into the ash pit "through a pipe
" or pipes connected with a rotary piston or pistons, consisting
" of a paddle or fan wheel." In this arrangement the air to feed
the combustion must pass through the pipe containing the fan
wheel, and rotate the fan wheel, thereby producing motive power.
Another arrangement is to place the fan wheel in the chimney
of the furnace and drive it by "exhaling action."

The above-mentioned properties of fire are utilized in "navi-
" gating the atmosphere." An aerial machine consists of a
furnace in which combustion is carried on and treated as already
explained. The chimney expands and terminates in a hollow
vessel which contains rarefied air and forms the balloon. The
furnace rests upon a platform which constitutes the car, and the
base of the hollow vessel is fixed to the platform. The machine
carries a propelling apparatus, consisting of vanes that are
" worked by the air-sucking faculty of fire " set forth above.

The said furnace may also be applied to ventilate the decks of
ships, to produce cold by the continuous current of air that it
causes, and to treat "ores, metals, or other substances by
" fire."

[Printed, 6d. No Drawings.]

1863.

A.D. 1863, April 6.—N° 867.

GEDGE, WILLIAM EDWARD (*a communication from Pierre Jacques Carmien*).—(*Provisional Protection only*.) “Improvements in aërial machines.”

“The car acting as ballast holds the balloon in an almost horizontal position. It contains the steam boiler, the water, the coal,” and other apparatus. Ascent to the fore part of the balloon is made by a rope ladder, which also holds the fore part of the car suspended thereto. The stern of the car is suspended to the stern of the balloon “by a pipe of aluminium, which conducts the steam to a machine fixed to the same piece as the bearing at the stern of the balloon.” The piston of this machine communicates motion “to a shaft which traverses the balloon in its entire length,” and thus rotates the balloon. “Another rope ladder leads from the car to a case near the machine, and another capstan or lever holding the two ends of the rudder cords at the stern of the car permits oblique divergence to the right or left. The body of the balloon is of ovoid form, the small end passes first, and the large end” “supports the bearing fixed to the machine, the rudder, and the oblique sails. These sails should present a surface of at least twice the thickness of the balloon, so that in turning they will press upon twice as much air as will oppose the end of the balloon. These sails, however numerous, may be all closed simultaneously by pulling a rope from the car during the progress of the balloon, and on pulling another rope the catch which holds the sails closed falls, and they open of themselves under the pressure of the wind.”

“The balloon may also be constructed entirely in the shape of a screw with the above arrangements.”

[Printed, 42. No Drawings.]

A.D. 1863, August 15.—N° 2028. (* *)

LÜDEKE, JOHANN ERNST FRIEDRICH.—(*Provisional Protection only*.) “Improvements in the means of keeping cameras or other apparatus steady when suspended to balloons.”

“My invention consists in keeping cameras or other apparatus steady when suspended to balloons at certain distances from the

“ earth, which is effected by means of a peculiar arrangement of
 “ two or more ropes attached to the car of a balloon, so that
 “ when the balloon is waving about the camera will be kept
 “ comparatively steady.”

One of the ropes has a weight attached, another rope is “ fastened to the ground at one end by any suitable contrivance,” and then passes over a pulley to a roller or drum “ for the purpose of raising and lowering the balloon, although other means for obtaining the same result may be employed in place of the roller. By this arrangement the camera will be kept steady and in its place.” The camera “ may be raised or lowered by means of a rope, and is opened and shut by suitable mechanism ; or I can make use of a wire in connection with a battery for the same purpose. I do not restrict myself to the use of any precise number of ropes, as they may be varied if considered necessary.”

[Printed, 8d. Drawing.]

A.D. 1863, August 29.—N° 2141.

WELDON, WALTER.—“ Improvements in apparatus for aërial navigation.”

The balloons used for the purpose of this invention consist of “ either a long narrow bag divided internally into separate compartments or cells, or, as will often be more convenient, especially in constructing machines of considerable size, any desired number of distinct bags is connected together, somewhat after the fashion of the carriages in a railway train, but with little or no interval between each bag and the next. In either case the construction must be such that the machine, when all its cells or compartments are distended with gas, shall be externally of the shape of a cylinder of considerably greater length than diameter, and that the cells or compartments or which it consists internally shall each be longer in the direction of the diameter than in the direction of the length of the cylindrical machine as a whole.” “ With its cells all filled with a gas lighter than atmospheric air, but having no communication with one another, a machine constructed as above described will float in the atmosphere horizontally, or with the longest axis parallel to the earth’s surface, and will so be capable of being propelled and steered.”

[Printed, 4d. No Drawings.]

A.D. 1863, October 23.—N° 2620.

PARKER, JAMES.—“Improvements in the application of steam
“combined with air as a motive power, and for other pur-
“poses.”

Superheated high-pressure steam is used, in one or more jets, to draw or drive air into or through one or more air pipe nozzles into one or more pipes communicating with a receiver from whence the steam and air is to pass to a steam cylinder or cylinders. The air in its passage to the cylinder or receiver becomes heated by the steam, whereby an increase of motive power is obtained. After it has been used as a motive power, the combined steam and air may be employed “as a warm blast to the
“furnace;” for this purpose it may be first passed “through
“gas tar, paraffin, petroleum, or liquids of a like nature, it will
“absorb a certain amount of the same, and may then be passed
“to the furnace to be applied for heating the boiler.”

“In cases where it is important to reduce the weight of the
“engine as much as possible, as for carriages for the common
“road and for balloon propulsion, I propose to use bellows or
“similar apparatus in place of the usual metallic cylinder and
“piston; when applied to balloons the hot air and steam after
“being used as a motive power may be further used either alone
“or with gas for inflating the balloon.”

The application of this invention to balloons is not mentioned in the Final Specification.

[Printed, 4d. No Drawings.]

A.D. 1863, November 24.—N° 2959.

NEWTON, WILLIAM EDWARD (*a communication from Eugene Godard*). — (*Provisional Protection only*.) “Improvements in
“balloons or aeronautic apparatus.”

This invention relates to the Montgolfier balloon, but some of the improvements are applicable to gas balloons.

1st. An air-heating apparatus (in which is burned straw) is placed in the car. The heated air is admitted to the interior of the balloon through suitable valves. “The air-heating apparatus
“consists of a cylindrical vessel made of sheet iron and sur-
“rounded by outer casings through which air may circulate.”
Through the spaces formed by these casings is made a fire door communicating with the interior of the apparatus. The com-

bustible matter is supported by iron bars, and the ash pan may be raised and lowered. Below the said bars "is a perforated truncated cone through which air passes to the burning fuel. A door is made in the lower part of the apparatus for the purpose of obtaining access to the interior. Above the fire-place is another perforated truncated cone, but inverted; through this the heated vapours pass up from the fire into a vertical cylindrical chamber which communicates at its upper end with the interior of the balloon."

2nd. "The employment of an elastic rope for the anchor." The elastic part is secured from too great strain by being combined with an ordinary rope.

3rd. "Adapting to the inflated balloon a parachute, which, when the balloon descends, will open and check its downward movement. This parachute is adapted to about the equator or largest diameter of the inflated part."

[Printed, &c. No Drawings.]

A.D. 1863, December 29.—N° 3284.

DE SAINT MARTIN, HENRY REDA.—(*Provisional Protection only.*) "Improvements in apparatus for aerial locomotion."

1st. "An apparatus having a respiratory action which gives it an ascensional momentum."

2nd. "An apparatus of propeller wheels" combined so as to "enable the aeronaut to move and guide himself in any direction."

"The inflational apparatus" or "lungs" "consists of two inflatable bags composed of any light suitable material, presenting the appearance of flattened half rings." To the upper and under surfaces "are affixed light thin rigid frames, the upper frame being left free to rise and fall with every inflation and collapsion of the said bags." The "lungs" are fed with hot air.

The propeller wheels are moved by a hot-air engine. One pair of propellers may be in the fore part, another in the hinder part of the "aerostatical apparatus."

"These propellers are to be in the form of helixes, more or less inclined to the plane of the horizon. The propeller shaft is turned by means of a pair of cogged wheels which are in communication with the hot air engine, by whose power they

"are made to revolve. The action of these wheels is similar to what is termed the 'planet and satellite' motion, the propeller being in immediate connection with the 'satellite,' the whole presenting a combination of movements resembling the actions of a man when in the act of swimming."

When the aeronaut is raised and supported in the air by the action of the "lungs," the peculiar movement of the propellers enables the aeronaut to regulate and accommodate the machine to the exigencies of his position."

[Printed, 4d. No Drawings.]

1864.

A.D. 1864, February 4.—N° 298.

DAVIES, GEORGE (*a communication from Ferdinand Charles Honoré Philippe d'Esterno*).—"Improved apparatus for facilitating "aërostation."

The said apparatus imitates the movements of birds "to obtain the direction (or management) of aerial flight." The act of flying is said to consist of "equilibrium, direction, and impulse." The action of wind upon the extended wings and tail, inclined or not, produces the "sailing flight," in which the position of the centre of gravity exercises considerable influence. "The ordinary flight" is imitated by three movements to the wings (vertical, horizontal, and torsional), three similar movements to the tail, and a movement of the centre of gravity; these seven movements are accomplished by the wings and tail being respectively connected to the car by an articulated joint capable of moving in any direction; a circular slide enables the wings to move backwards and forwards, and the centre of gravity is shifted by the position of the aeronaut.

The Drawings show an apparatus for "reproducing" the "sailing flight," in which the wings have a "flapping" movement, as well as a movement round a horizontal axis, and in which the tail has the movements referred to in "the ordinary flight." The frame carrying the wings is hinged to the top of the car; the two side rods of this frame form the centres from which the flapping motion takes place by means of ropes that pass

round pulleys; the hinge of the frame furnishes the other movement of the wings. The tail is on a universal joint which is worked by another universal joint connected to the first by a rectangular frame. By means of hand wheels, handles, and screws the whole of the mechanism is worked by the aeronaut and is under his guidance.

[Printed, 1s. Drawing.]

A.D. 1864, March 9.—No 591.

BROOMAN, RICHARD ARCHIBALD (*a communication from Pierre Quentin*).—(*Provisional Protection only*.) "Improvements " in balloons and in apparatus connected therewith."

A number of persons ascend "in balloons secured to apparatus " on the ground by ropes caused to run out and in by any " convenient appliances." Although only one balloon may be employed, it is preferred to work two balloons in conjunction, one with the other, one of which ascends while the other is descending. The rope by which the said balloons are connected is put in motion by "the aid of a large roller, round which the rope is " wound, and from which it is free to be run out its whole length " in either direction." The two balloons are kept at some distance from each other. "The rope may be worked by means " of pulleys and rollers placed below the platform from which " the car is entered, so that the rope may be kept in a vertical " position as far as may be. This apparatus is contained in a " construction of masonry. The ropes which support the balloon " and the car and the holding rope are all united to a cylindrical " spar, on which they are free to move, in order always to maintain the car in a vertical position."

The balloons are formed of a strong outer envelope, which encloses one or two others of lighter fabric. The network of the balloon may be prolonged in cords, to combine the network itself with the envelope, and the envelope, thus consolidated, may be terminated by a circular frame which is connected "to the centre " of the cylindrical spar by mechanism, which regulates the strain " by a strong spring." Air is in the lower part of the envelope, separated from the gas in the upper part by an impermeable diaphragm. Suitable valves are provided. Other details are set forth.

[Printed, 4d. No Drawings.]

A.D. 1864, March 24.—N° 748.

GEDGE, WILLIAM EDWARD (*a communication from Pierre Jacques Carmien*).—(*Provisional Protection only*). “An improved “aerial machine.”

The balloon of the machine is cylindrical, “terminated at its stern by a spherical cap, and in front by a cone.” The envelope is applied to metallic “circles,” which are strengthened by steel wire ties “attached to the axle of the balloon.” This axle is longitudinal, and supports “a skeleton framing” by means of “two vertical pieces.” The framing is strengthened by steel wire ties. A shaft is driven by a steam engine supported in the centre of the said skeleton framing or car; by means of pulleys on the driving shaft, and cords that pass “in grooves made in the “circles or rings of the balloon,” axial rotary motion is communicated to the balloon. Air may be blown, at pleasure, into two hemispheres, placed respectively at the two extremities of the balloon; the bellows for this purpose is driven by the engine. “In front of the cone on the fore part of the balloon is placed the “rudder.”

The machine acts as follows:—The balloon, filled with hydrogen, having risen, and the sails being in the proper position, a rotary movement is given to the balloon and it “advances by the “effect of the rotary motion of the sails in virtue of the difference “of the resistance and the force.” The emptying or filling of the aforesaid hemispheres with air causes the ascent or descent of the apparatus. “To aid in ascending and descending two archimedean screws are placed in the car, and are turned in one or “other direction at will.”

[Printed, *id.* No Drawings.]

A.D. 1864, August 9.—N° 1982.

CLARK, WILLIAM (*a communication from Alexandre Marie Quinet, and Achille Baudouin*).—“Improvements in the manufacture of india-rubber balls and other elastic recipients, and in the valves applied to the same.”

1st. The application to the said balls, &c. of “self-acting “internal means for closing the same.” They are filled and emptied by the same opening, which the pressure of the contained fluid serves to close.

2nd. “The employment of india-rubber valves composed of a

“ base of such material of greater or less thickness perforated at the centre, and furnished with a tongue piece, also of india rubber, which is caused to adhere to the internal face of said base piece for a portion only of its surface, the remaining part forming a valve, closing the orifice before mentioned.” This valve is vulcanized at the same time as the ball to which it has been previously applied, and so unites the whole together. The valve may, in certain cases, consist of a single tongue, applied on the inside of the hole in the ball.

3rd. The application of these valves “to all kinds of recipients,” and among the rest “to air or gas balls or balloons.” The latter application is not mentioned in the Provisional Specification.

4th. To inject the air or gas a mouth-piece, having a short tube with a side opening, is used, the tube being inserted into the valve orifice. Instead of using the mouth to inflate the ball, a small India rubber ball with a valve to it may be fixed on to the said mouth-piece.

5th. Producing designs or inscriptions “on the vulcanized india-rubber recipients.”

[Printed, 8d. Drawing.]

A.D. 1864, August 15.—N^o 2030.

BROOMAN, RICHARD ARCHIBALD (*a communication from Charles Edmond François Couturier*).—(*Provisional Protection only*.) “An improved aerostatic machine.”

“This machine may be used for travelling through the air, or as a toy. It is composed of a hollow body, with extending arms concave below, and with a horizontal tail concave above. It carries a screw when used as a toy.

“When used for travelling through the air the body is in the form of a basket for containing the aeronaut; the arms are fixed for a distance from the body and terminate in wings or flappers. Springs are fitted at the connection of the wings and arms, and by means of cords the aeronaut works the flappers, and may progress even against the wind.

“When as a toy, the body is in the shape of a bird, and the arms and wings are fixtures; and extending upwards from the body is a rod, which carries a screw moveable upon the rod; the air causes the rotation of the screw, and carries along the toy.”

[Printed, 4d. No Drawings.]

A.D. 1864, September 14.—N° 2245.

HAMMOND, THOMAS RUNDLE. — (*Provisional Protection not allowed.*) "A new system or mode of transportation of packages " or other objects from one place to another, by land, by water, " or in the air by instantaneous or by graduated speed."

"This invention consists in the application of india-rubber, " properly vulcanized to the soft or elastic state, as a means of " rapidly taking away and carrying from one place to another," " of any object attached to said rubber while in a state of " tension."

To transport an object across a piece of water, a solid cord of vulcanized India rubber of suitable size has its entire length protected by a fixed tube, and has one end firmly fastened at a point which is sufficiently inland; the other end of the cord is "solidly " attached " to a rope corresponding in length to that of the space to be traversed. The free end of the rope being carried to the opposite point of land, its entire length is there wound upon a wheel "by means of a stationary steam engine until the end of " the distended rubber cord should arrive." The object is then fastened to the "rubber cord," the rope remaining attached thereto, the rope is allowed to go free, and the object is conveyed across the intervening space; the "rubber cord " thus regains its original position, and is ready to be brought back by the rope for the transportation of another object or package.

Balloons may also be transported by means similar to that above described for water carriage.

"Graduated speed is accomplished by simply graduating the " size or thickness of the rubber cord to the weight to be transported, and the speed desired."

[Printed, 4d. No Drawings.]

A.D. 1864, September 20.—N° 2299.

MENNONS, MARC ANTOINE FRANÇOIS (*a communication from Gustave de Struve, and Nicolas de Telescheff*).—"Improvements " in aerial navigation, and in the apparatus connected there- " with."

These improvements are based on the employment of certain stationary or moveable concave surfaces.

One mode of aerial navigation is based upon the principle of reducing the velocity of a falling body of a given weight by

increasing and forming its surfaces so "as to produce the maximum amount of resistance" to the air, and thus to reduce the amount of power required to sustain the falling body. To displace in the air a heavy body, the said surfaces are capable of being changed at will from one angle to another, and they can be acted upon by a motor of sufficient power to overcome the resistance of the air in the direction of its movement.

The horizontal displacement of heavy bodies provided with certain stationary surfaces constitutes a second mode. The surfaces are three in number, inclined at angles determined by the decomposition of the forces acting upon them.

The horizontal displacement in the air of heavy bodies provided "with wings or moveable surfaces of a particular form, and with a spring tending constantly to draw these wings towards the body, constitutes a third mode of aerial navigation."

The Drawings show a machine constructed according to the first mode, which has a motive engine, fixed surfaces, a horizontal rudder, weighted regulator, screw, and vertical rudder. A machine is also shown "with moveable wings intended for the transport of one person who serves as motor."

[Printed, 1s. 2d. Drawings.]

1865.

A.D. 1865, April 1.—N° 930.

HAENLEIN, PAUL.—(*Provisional Protection only.*) "Improvements in navigable balloons."

1st. Giving to the "aerostat containing the buoyant gases the form or shape of a paraboloid, elypsoid, hyperboloid, or some form approaching those figures."

2nd. One or more rudders or steering vanes (the light frame or frames of which is or are covered with silk) is or are applied to the balloon. A screw for horizontal propulsion (mounted on a horizontal shaft) is placed in front of the balloon. Below the car is placed a smaller screw for regulating the altitude of the balloon.

3rd. The gas engine is applied to the propulsion, both horizontally and perpendicularly, of balloons in general, or of the

shafting connected respectively with the before-mentioned screws, and thence of the balloon itself, either horizontally or vertically according to the screw which is in connection with the engine shaft. The engine shown is a cylinder and piston engine that works a crank shaft, on the axis of which the eccentrics for giving motion to the valves are mounted. The principal working parts of the engine are constructed hollow.

4th. The gas for propulsion is derived directly from the aerostat, the space thereby rendered vacant being made up by the forcing of air into a "compensating" balloon placed inside the larger balloon or aerostat. The discharge of ballast compensates for the loss of buoyant power.

5th. The propeller is of the helical form, but "paddles or some combination would answer the same purpose."

[Printed, &c. Drawing.]

A.D. 1865, April 12.—N° 1037.

ROTHLEB, GUSTAVE WILHELM.—(*Provisional Protection only.*)
"A new apparatus or mechanism for flying through the air."

A strong but light framing surrounds the body of the person who is about to fly, and is attached thereto round the waist. Two elastic reservoirs of hydrogen gas are attached to the framing, one on each side. The framing is prolonged in front and behind to a distance of from six to ten feet. A "windrose" in the fore part consists of a strong but light framing, "divided into arms like the sails of a windmill," mounted on an axle; this is of use when flying against the wind, and is covered with canvas. The arms rotate and cut the wind. The rudder at the hinder end of the framing consists of a revolving wheel with feathering spokes; this is worked by cords.

The wings are composed of light steel or iron ribs covered with canvas; they may be from five to eight or nine feet long, are attached to the framing "by elastic bands passing over pulleys attached to the framing, and are kept distended by steel springs; their motion is accomplished by means of spiral springs attached to the ribs or framing, and under the control of the person flying, who works them by the motion of his arms or his body. The wings I form so as to fold up when not required, and so as only to expose a portion of their surface if found sufficient."

[Printed, &c. No Drawings.]

A.D. 1865, April 17.—N° 1073.

MATTHEWSON, JAMES JOHN, and SCHLEE, HEINRICH LOUIS RUDOLPH.—(*Provisional Protection only.*) "Improvements in rotatory aerial swings."

"This invention relates to swings which rotate in a vertical direction upon an axis mounted horizontally in vertical supports or standards, and consists, first, of, an improved mechanical arrangement for imparting rotatory motion thereto. Hitherto swings of the above description have had rotatory motion imparted thereto by means of one or more winch handles fixed in a direct line with the axis of the swing, and for that purpose a high stage was required for the person or persons to stand on for imparting rotatory motion to the said winch handle or handles. We propose to dispense with the above-mentioned stage, and to impart rotatory motion to the axis of the swing by the following means :—Upon the ground and concealed within an ornamental Swiss cottage, we arrange a system of wheel-work worked by a winch handle, and in connection therewith we arrange a pulley, over which and also over another pulley fixed on the axis of the swing we pass an endless band or chain, by which we transmit rotatory motion from below to the swing above.

"A further improvement in rotatory aerial swings consists in adapting over each of the several cars of the swing a small balloon having an air-tight cover fixed over a light framework, and either inflate said balloons or not, as may be desirable. The use of these balloons is to allow the wind to act thereon, and assist in turning the swing round upon its axis of motion, and if inflated to reduce the weight of the swing when in use, and make it move with less exertion."

[Printed, 4d. No Drawings.]

A.D. 1865, July 28.—N° 1953.

LAROCHE, LEON PAUL.—(*Provisional Protection not allowed.*) "Improvements in fire engines and hydraulic machines."

Fixed at the lower part of the piston of a pump "there are metallic plates or plates made of any other material; those plates ought to be made very thin, and shaped like the blades of sharp-edged and polished razors; they might be substituted by conic-pointed needles made round, square, or triangular, or any other shape that might be thought proper to the materials."

The Drawings also represent a double-action piston, furnished on both sides with edged plates or sharpened points. These edged plates or sharpened points are likewise represented as a constituent part of a forge "blow pipe," and of a pair of bellows. The description of the "raising power of a pump" seems to show that the inventor relies upon capillary force as the principle which is carried out by the edged plates or sharpened points.

"The principle adopted in Laroche's invention may be applied to every description of aerial machines, and in inflating balloons, in which case the interior part of the canvas must be furnished with small conic cords or strings, made either of silk or cotton. The canvas or material the balloon is made of must be about 40% stronger, in order to resist bearing. The blow pipe and inside parts already set in motion by the working or motion must be provided with conic sharp-pointed plates or needles."

The said principle can be applied to "aerial machines requiring forges."

[Printed, ed. Drawing.]

A.D. 1865, August 28.—N° 2208.

BONNEVILLE, HENRI ADRIEN (*a communication from Charles Edmond François Couturier*).—(*Provisional Protection only.*) "Improvements in the construction of flying toys, also applicable to other purposes."

"For toys this construction is as follows:—Wings of suitable size, made of thick paper or cardboard, are attached to a central body of any required form, and of proportionable weight. The whole is disposed so that the centre of gravity falls near the front part of the body, and the extremities of the wings are bent slightly backward and downward. A rudder is placed at the hinder extremity of the body, which serves to aid its flight. When these bodies are wished to fly rigidly, that is, with only the amount of play on the wings to be obtained from the elasticity of the material, the body, tail, and wings are fixed in the same plane, and form one right line; but when the wings are wished to flap to imitate the movement of a bird's wings, I make them hinged to the front and upper part of the body, and give the front part of the body an inclined plane downwards, its centre a horizontal plane, and the tail an inclination upwards. I also control the flapping of the wings by a thread,

“ a piece of wire, or other suitable means. When the principle
“ is intended to be applied to a parachute, the wings would be
“ made of silk mounted on a suitable framework.”

[Printed, 4d. No Drawings.]

A.D. 1865, December 19.—N° 3283.

CLARK, WILLIAM (*a communication from Solomon Andrews*).
“ Improvements in apparatus for aerial navigation.”

“ Three aerostats of a cylindrical form pointed at each end,”
“ are jointed together by a membrane or diaphragm at their
“ longitudinal equators, covered by a net, from which four rows
“ of cords extend to a long and narrow car suspended below the
“ centre, the ballast and aeronaut being in the car. It ascends
“ and descends on inclined planes in the atmosphere, because of
“ its form or construction, whenever it is poised obliquely. The
“ angles of inclination are produced by the position of the aero-
“ naut in the car or the removal of other weights, and it is
“ steered by a common rudder. To navigate the air with this
“ vessel it is only necessary to step to the rear end of the car, thus
“ elevating the bow five to ten degrees, and by throwing out a
“ little ballast she will go ahead on the ascending plane. When
“ she has ascended as high as the aeronaut wishes to go, he opens
“ one of the valves and discharges some gas, at the same time
“ stepping toward the forward end of the car, which will depress
“ the bow, elevate the stern, and so change the angle of inclina-
“ tion, when she will go ahead on the descending plane.” This
action is continued, even against the wind, until the aeronaut
wishes to descend.

There are descriptions and Drawings of balloons upon this
principle, of various sizes and shapes, and particularly of one “ as
“ she appeared on the 4th of September 1863,” which had an
ascending power of more than two hundred pounds.

“ An angulometer” consists of two grooves, between which a
marble runs on the curved bottom of the car, and thus indicates
the angle of the car to the horizon.

[Printed, 10d. Drawing.]

1866.

A.D. 1866, April 23.—N° 1143.

BUTLER, JAMES WILLIAM. — (*Provisional Protection only.*)
 “Improvements in aerostatic apparatus.”

A large light frame is hinged to the back of the person across the shoulders, “the upper edge of the frame being at about that level,” “the lower edge being secured by straps so that the surface shall take and maintain any particular angle or incline desired;” this surface gives “the ascending power.” Two light standards rise from this inclined surface, and “pinions” are jointed thereto, one to each; these pinions or wings “are held and pulled upwards by cords and india-rubber springs stretched between them. The pinions consist each of a long light arm, either curved or otherwise; the stem or joint is adapted for the operator to grasp in his hands (one in each hand), while throughout its length it is furnished with a series of stretchers of whale-bone extended in the backward direction, on which stretchers and arm silk or other light material is distended by imparting an up-and-down motion to the arms, the elastic stretchers will be deflected, and the whole surface inclined by the pressure on the air, and will produce a tendency to forward motion.” The operator pulls the pinions downwards, and allows them to rise by the force of the before-mentioned springs; a tendency to upward as well as forward motion is thus obtained. To acquire power for rising, the apparatus (on a carriage) is allowed to run quickly down an incline. The operator (according to another plan) may either jump from an elevation, or be pulled by a rope “at a great velocity through the air.”

[Printed, 4d. No Drawings.]

A.D. 1866, May 29.—N° 1497.

BOYMAN, RICHARD BOYMAN. — “Improvements in propelling vessels by the reaction of water, and in the machinery for the purpose.”

The allusions that are made in this Specification to aeronautics are:—1. That the “science for propulsion” treated of in this Specification “is the science of the future for propulsion in air and water.” 2. “That the principle of reaction will be the only method of propulsion on land, water, and in air.”

AER.

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This invention consists "in propelling vessels by the reaction of water as a substitute for the paddle wheel and screw."

The novel features of the invention are:—

1st. "A propelling pipe for reaction propulsion, with its mouth towards the bow, fitted with expanding and contracting valves."

2nd. "The same submerged propelling pipe without valves" under certain circumstances.

3rd. "A divergence of pipe at each end for the easier entrance of the water, and to prevent the formation of the contracted vein at entrance."

4th. "The contracted vein for reaction in combination with an open entrance for the water."

5th. A "permanent contracted vein nozzle," "either fixed or moveable," "in combination with another entrance for the water, and expanding and contracting valves."

6th. A certain "method of working the expanding and contracting valves."

7th. A certain "method of getting the outside or large cam for hydro-propellers, single or double-acting;" "also the float boxes and connections to reduce leakage;" also an "inside cam, not by itself, but in combination with six or more floats, propelling pipe, and contracting and expanding valves."

8th. "Six, eight or more floats in the propeller," by which arrangement "a small angular entrance and curvature to reduce the friction of the propelling water" are obtained.

9th. "The application of a horizontal or vertical propeller, partly protruding through the sides or beneath the vessel to work in propelling tubes outside."

10th. Certain "side rudders and safety repairing valves."

11th. "The general combination of the different parts and proportions" of this invention.

In an "amended Disclaimer and Memorandum of Alteration," dated October 31st, 1867, the patentee disclaims the eighth and ninth features of the invention, and makes sundry alterations. In the said amended Disclaimer and Memorandum of Alteration no mention is made of the application of the invention to the propulsion of vessels in the air.

[Specification printed, 3s. 2d. Drawings. Disclaimer printed, 10d. Drawing.]

A.D. 1866, June 7.—N° 1571.

WENHAM, FRANCIS HERBERT.—(*Provisional Protection only.*)
 “Improvements in apparatus for aerial navigation.”

A novel arrangement of surfaces, placed one above the other, is “kept in parallel planes by means of cords, or rods, or webs “of woven fabric.” Each surface is made of silk, or other light material, stretched in a frame or by other means. “The long “edges” of the surface are placed “foremost in the direction of “motion.” This system of surfaces is arranged above a “suitable structure for containing the motive power.” If manual power is employed, the body is placed in a horizontal position. “The arms or legs work a slide or treadle from which the connecting cords convey a reciprocating motion to oars or propellers which are hinged above the back of the person working them. The oars extend out sideways, each consisting of a spar at the end of which is a fabric stretched by ribs resembling the wing of a bat. Several persons may be placed side by side and work the treadles together. If the machine is held against the wind with the planes slightly inclining upwards it will be raised. The treadles are then to be worked in order to continue the motion. If there is no wind a start may be obtained by lowering the legs beneath the machine and running down hill; or the machine may be laid on a carriage running down an incline or drawn forward by some temporary motive force; if a steam engine or other motive power is employed one or more screws or rotary vanes may be applied for propelling the machine.”

[Printed, 4d. No Drawings.]

A.D. 1866, September 26.—N° 2489.

BOULTON, MATTHEW PIERS WATT.—(*Provisional Protection only.*) “Improvements in apparatus for employing the motive power of jets of fluid.”

When a ship or vessel is to be propelled through water by means of this invention, the said ship or vessel “carries within it “a vessel in which aeriform fluid is generated or contained under “pressure, and a jet of fluid issues from a nozzle or orifice communicating with this vessel,” by issuing into the water at the hinder part of the ship in the direction in which the said ship is to be propelled, the jet “produces a current of water also moving

“ in like direction.” The current thus produced is “ so deflected
 “ as to be turned backward, so as to quit ” the deflecting surface
 “ in a direction contrary to that which it had before impinging
 “ on the surface.” The pressure exerted by the current on the
 surface on which it impinges and by which it is deflected propels
 the ship.

When a vessel is to be propelled through the air, “ the jet or
 “ jets of fluid should issue into air and set air in motion, the
 “ action of the current produced being similar to that previously
 “ described. The fluid issuing from the jet or jets might be sup-
 “ plied from substances which disengage gas rapidly when heated.
 “ The motive power of the jets being employed to produce rapid
 “ forward motion, the necessary elevating force might be obtained
 “ by the use of inclined planes, surfaces, or vanes.”

This invention may also be applied “ to the production of
 “ rotary motion.”

[Printed, 4d. No Drawings.]

A.D. 1866, October 30.—N° 2809.

BOULTON, MATTHEW PIERS WATT.—(*Provisional Protection only.*) “ Improvements in apparatus for employing the motive
 “ power of jets of fluid.”

In applying this invention to the propulsion of vessels through
 water, the ship to be propelled “ carries within it a vessel in which
 “ aeriform fluid is generated or contained under pressure, and a
 “ jet of this fluid issues from a nozzle or orifice communicating
 “ with this vessel; this jet issues into water supplied from the
 “ water outside the ship or vessel, and sets in motion a current of
 “ water moving in the same direction as the issuing jet. The
 “ current thus produced impinges on a curved surface or flows
 “ through a curved channel by which it is deflected, so that it
 “ flows away into the water outside the vessel in a direction con-
 “ trary to that in which it is desired to urge the vessel, or nearly
 “ in that direction. The pressure exerted by the current on the
 “ surface or body by which it is deflected propels the ship or vessel.
 “ The current before impinging on the deflecting surface or body
 “ may move through a passage or passages in which its velocity
 “ is reduced and a portion of its vis viva converted into pressure
 “ or potential energy, so that it may act on the surface partly by
 “ pressure, and partly by vis viva.”

" If this invention is applied to the purpose of propelling vessels or bodies moving through the air then the jet or jets of fluid should issue into air and set air in motion, the action of the current or currents produced as a means of propelling the vessel being similar to that above described."

[Printed, 4d. No Drawings.]

A.D. 1866, December 12.—N° 3262.

BOYMAN, RICHARD BOYMAN.—"Improvements in applying jets of steam by action and reaction to propel vessels and aerial conveyances, with other improvements in the latter and in the machinery for both, parts of which are applicable for other hydro and aero purposes."

The portion of this Specification relating to aerial navigation sets forth the present state of the subject in general, the power to be used, and the fuel to generate that power; also formulæ respecting the aerostat, and machinery to work the said aerostat or "gaseous envelope."

The chief applications of the principles enunciated by the inventor are:—

1st. The use of a "gaseous envelope for aerial navigation" of the shape of a cylinder with conical bases.

2nd. The propulsion of aerial machines by the application of hydrogen gas to that purpose. The gas forms "the generating, elevating, and renewing power."

3rd. "A separate gaseous receiver" is used "when it is desirable to keep the generating and elevating power apart."

4th. Aerial machines are propelled "by making the element of resistance, air, the means of overcoming it by reaction." The air, for this purpose, is set "in motion for reaction by jets of steam and hot air acting in equivalent or other reaction tubes."

5th. Aerial machines are raised and depressed "by reaction tubes" called "elevators and depressors;" "also by moveable ballast to keep the machine at the required angle for such purpose."

6th. Aerial machines are steered "by side rudders or reaction tubes."

7th. "The general combination and proportion of parts, as means to ends, for aerial navigation."

The Drawings show an aerostat (of the shape set forth in the 1st application) supporting a car or saloon that contains the aeronaut, crew, and passengers; also the steam apparatus for propelling, and the machinery to work the side rudders. The high-pressure steam is obtained by means of a boiler, in the furnace of which a mixture of hydrogen gas and air is burned; the steam is utilized by passing it through a steam jet into a tube of considerable size (called a reaction tube), and out into the air. The direction of the exit from the reaction tube may be altered so as either to propel, raise, or depress the machine.

The patentee refers to the Specifications of former Letters Patent granted to him, Nos. 1155 (A.D. 1860), and 1497 (A.D. 1866), and also to several Specifications of other inventors, which, however, do not relate to the subject of the present series.

References to books, letters, and philosophical papers, also calculations, mathematical formulæ, theoretical views, quotations, reflections, opinions, and speculations are given at full length in this Specification.

[Printed, 4s. 10d. Drawings.]

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 Dublin (*Dublin Library, D'Olier Street*).
 Edinburgh (*Horological Society*).
 Ennis (*Public Library*).
 Gloucester (*Working Men's Institute, Southgate Street*).
 Ipswich (*Mechanics' Institute, Tavern Street*).
 Kew (*Library of the Royal Gardens*).
 Kingston, Herefordshire (*Reading Institute*).
 Leominster (*Literary Institute*).
 London (*House of Lords*).
 ——— (*House of Commons*).
 ——— (*Hon. Soc. of Gray's Inn*).
 ——— (" " *Inner Temple*).
 ——— (" " *Lincoln's Inn*).
 ——— (" " *Middle Temple*).
 ——— (*Aeronautical Society*).
 ——— (*British Horological Institution*).
 ——— (*General Post Office*).
 ——— (*Institution of Civil Engineers*).
 ——— (*Odontological Society*).

London (*Royal Society*).
 ——— (*United Service Museum*).
 Manchester (*Literary and Philosophical Society, George Street*).
 ——— (*Mechanics' Institution, David Street*).
 Newcastle-upon-Tyne (*North of England Institute of Mining Engineers*).
 Oxford (*Bodleian Library*).
 Stretford, near Manchester (*Mechanics' Institute*).
 Swindon, New (*Mechanics' Institute*).
 Tamworth (*Library and Reading Room, George Street*).
 Yarmouth, Norfolk (*Public Library South Quay*).

British Colonies and Foreign States.
 British Columbia—*Mechanics' Institute, Victoria*.
 ——— *Public Library, New Westminster*.
 France—*Academy of Science, Paris*.
 Netherlands—*Bibliothèque de l'Ecole Polytechnique de Delft*.
 Russia—*Imperial Technological Institute, St. Petersburg*.
 Smyrna—*Literary and Scientific Institute*.
 United States—*American Institute, New York*.
 ——— *Institution of Civil Engineers, New York*.
 ——— *Smithsonian Institute, Washington*.

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If any Patentee should be desirous of exhibiting a model of his invention in London, he may avail himself of this Museum, which has been visited since its opening on the 22nd June 1857 by more than 1,720,000 persons. The model will be received either as a gift or loan ; if deposited as a loan, it will be returned on demand. Before sending a model, it is requested that the size and description of it shall first be given to the Superintendent of the Patent Office Museum.

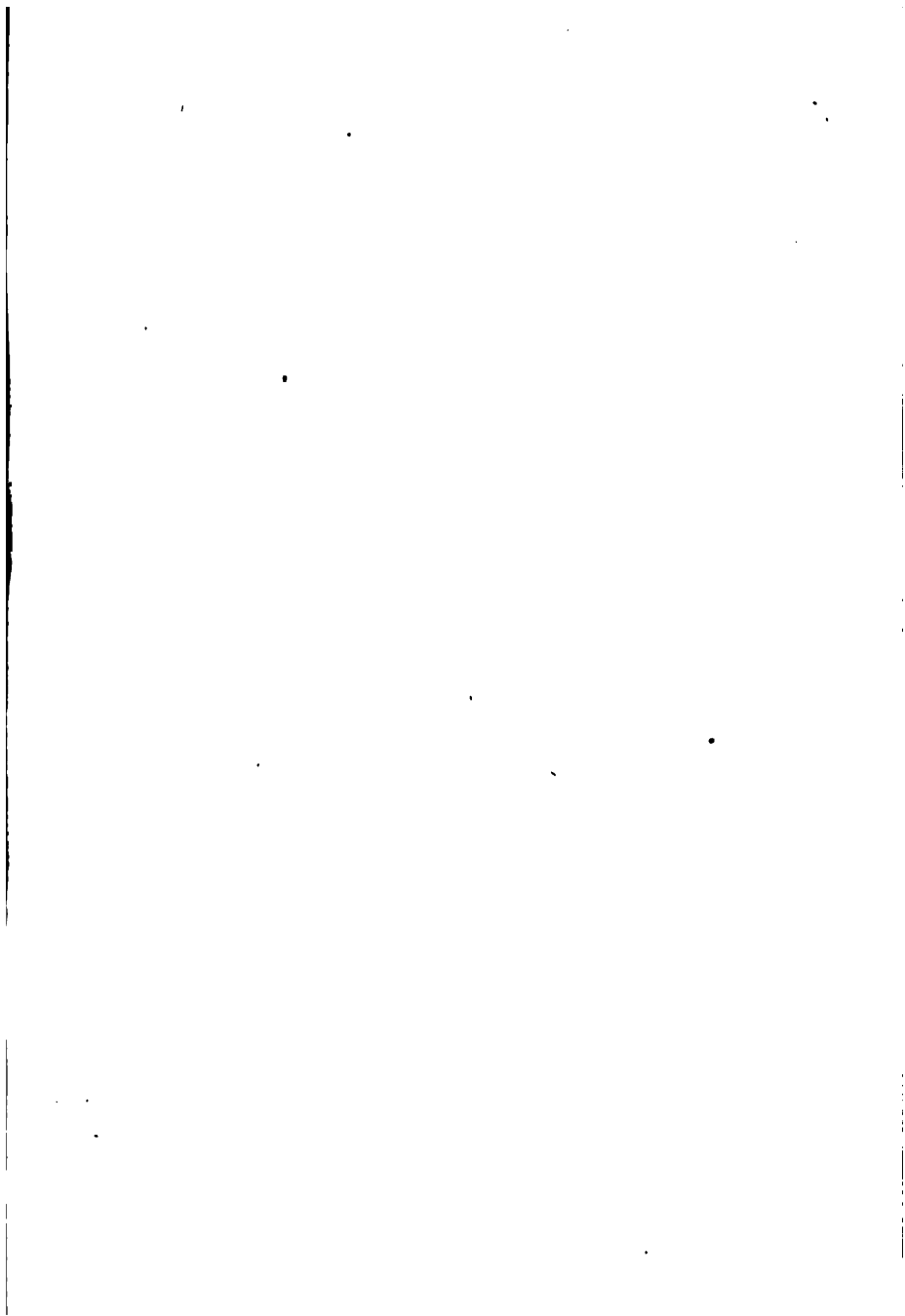
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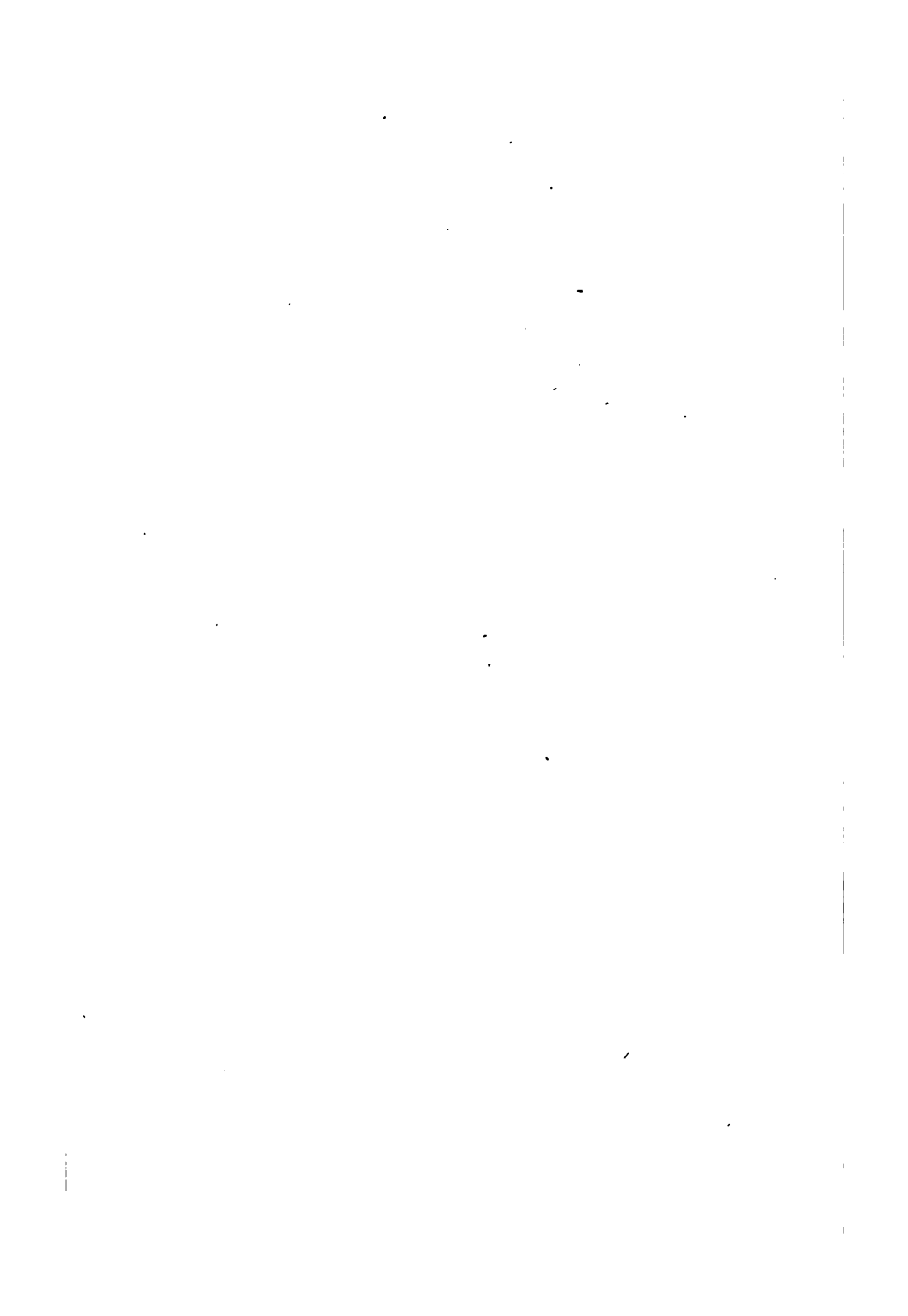
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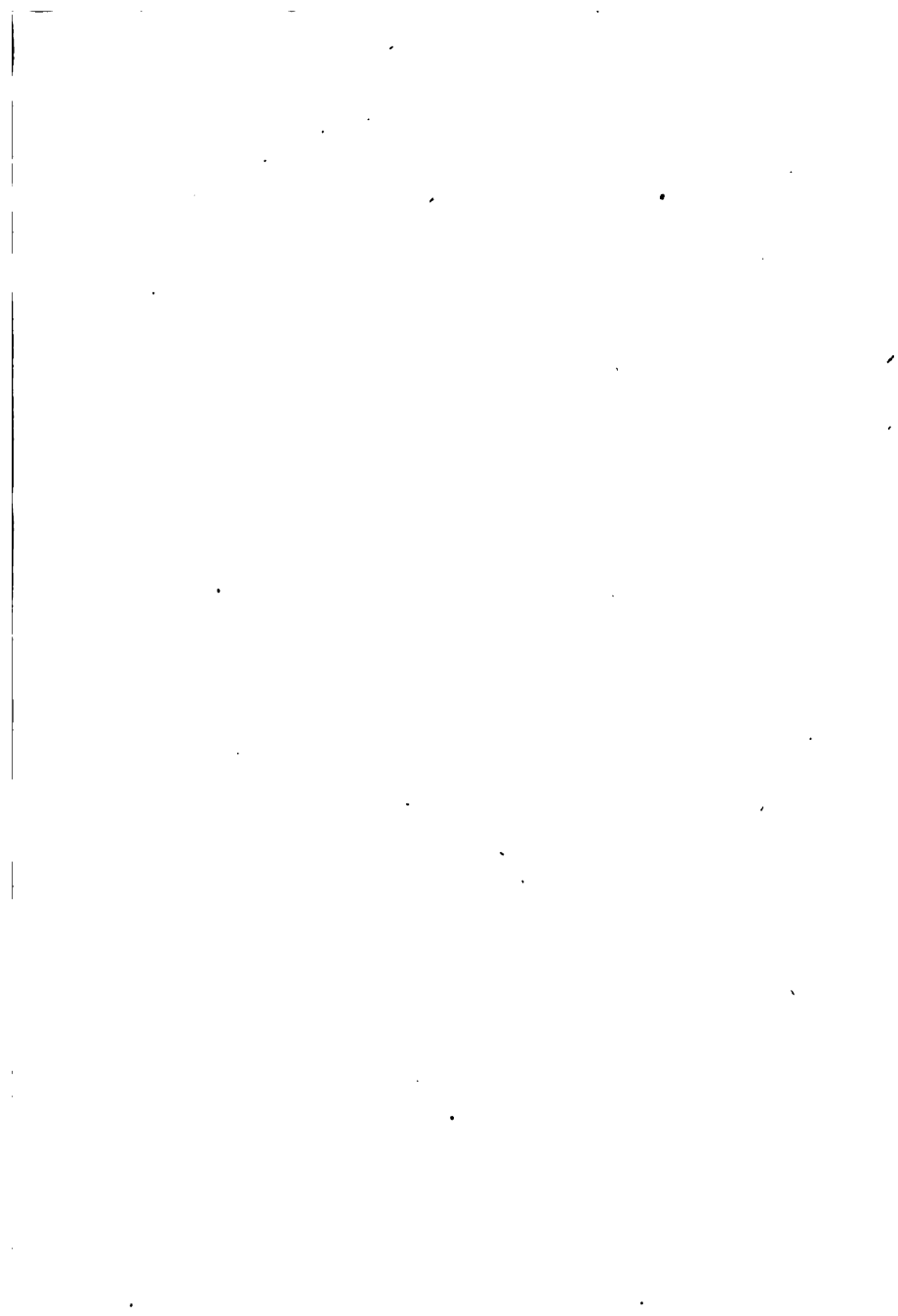
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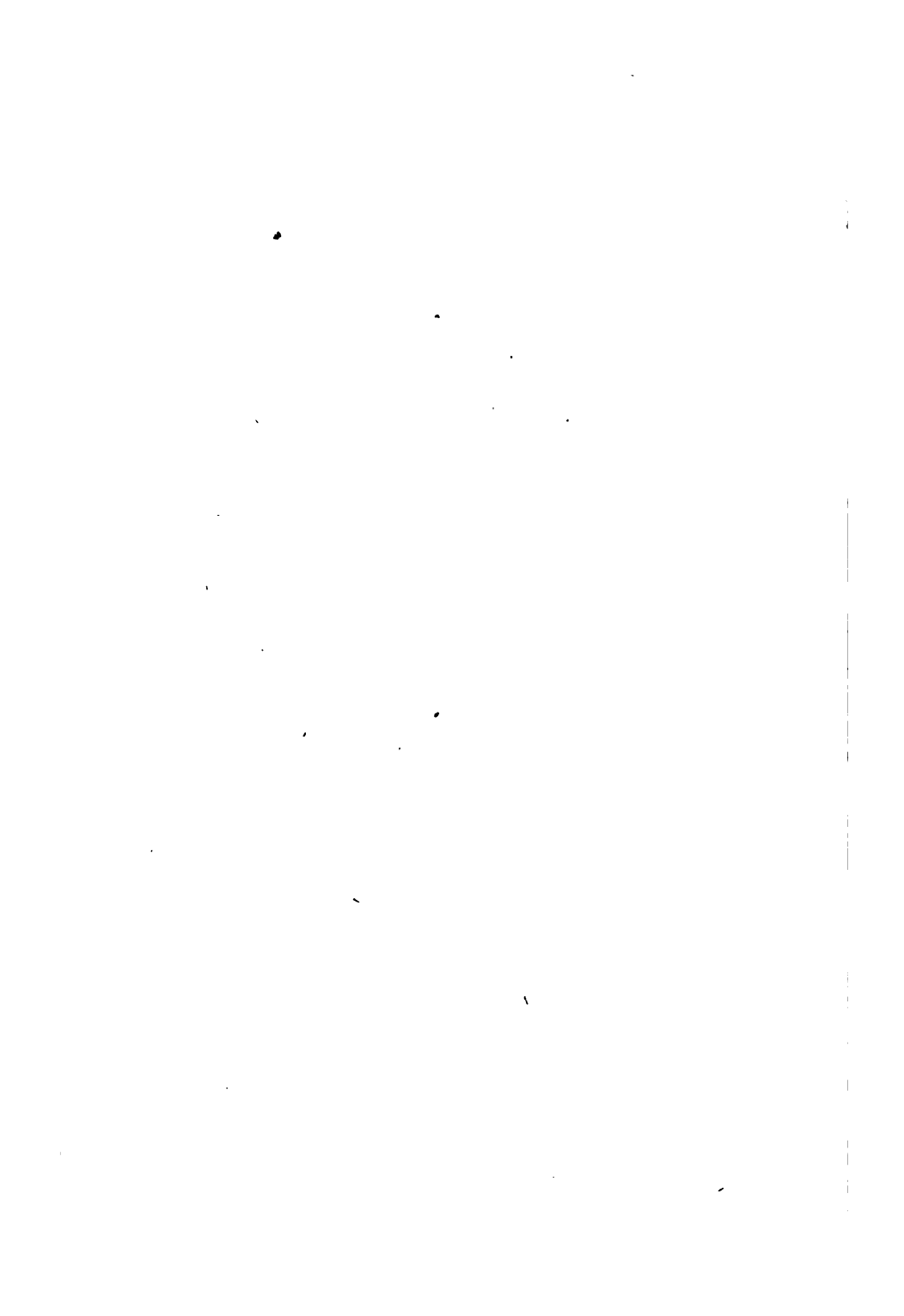
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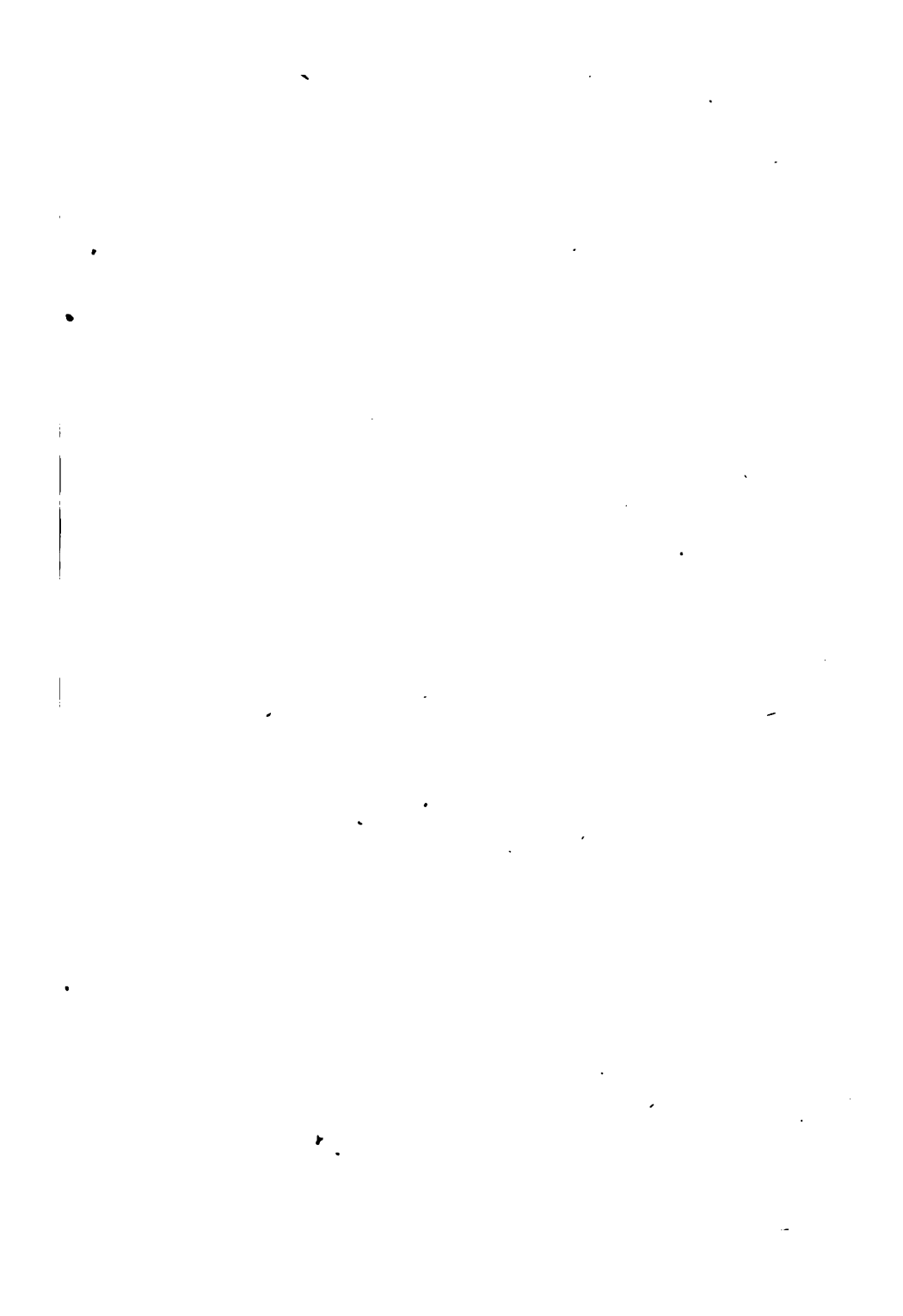


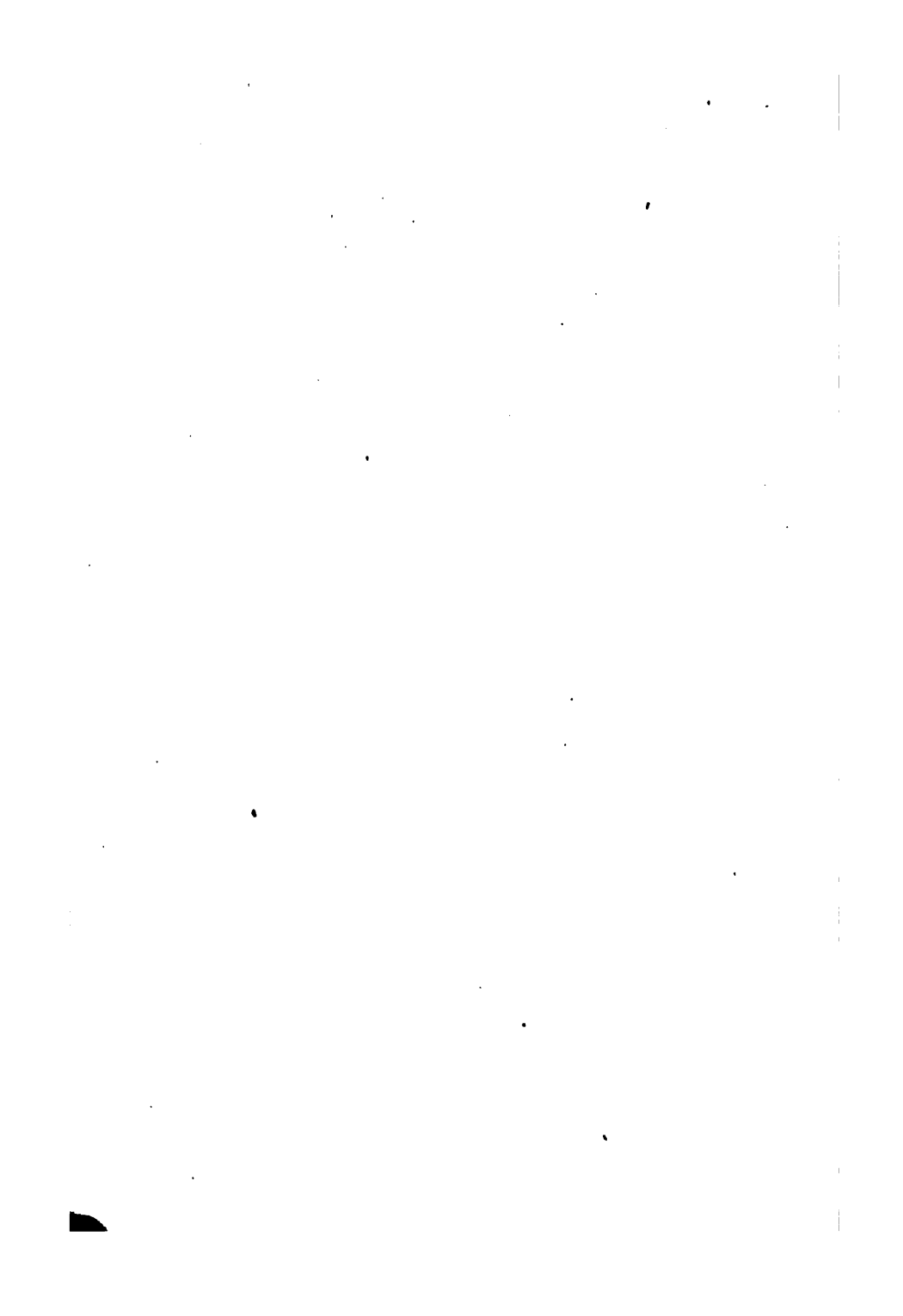


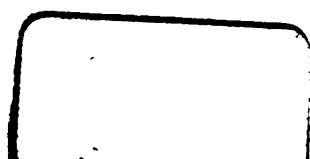












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